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A Multi-Disciplinary Evaluation of the

CALGARY PARKWAY RING

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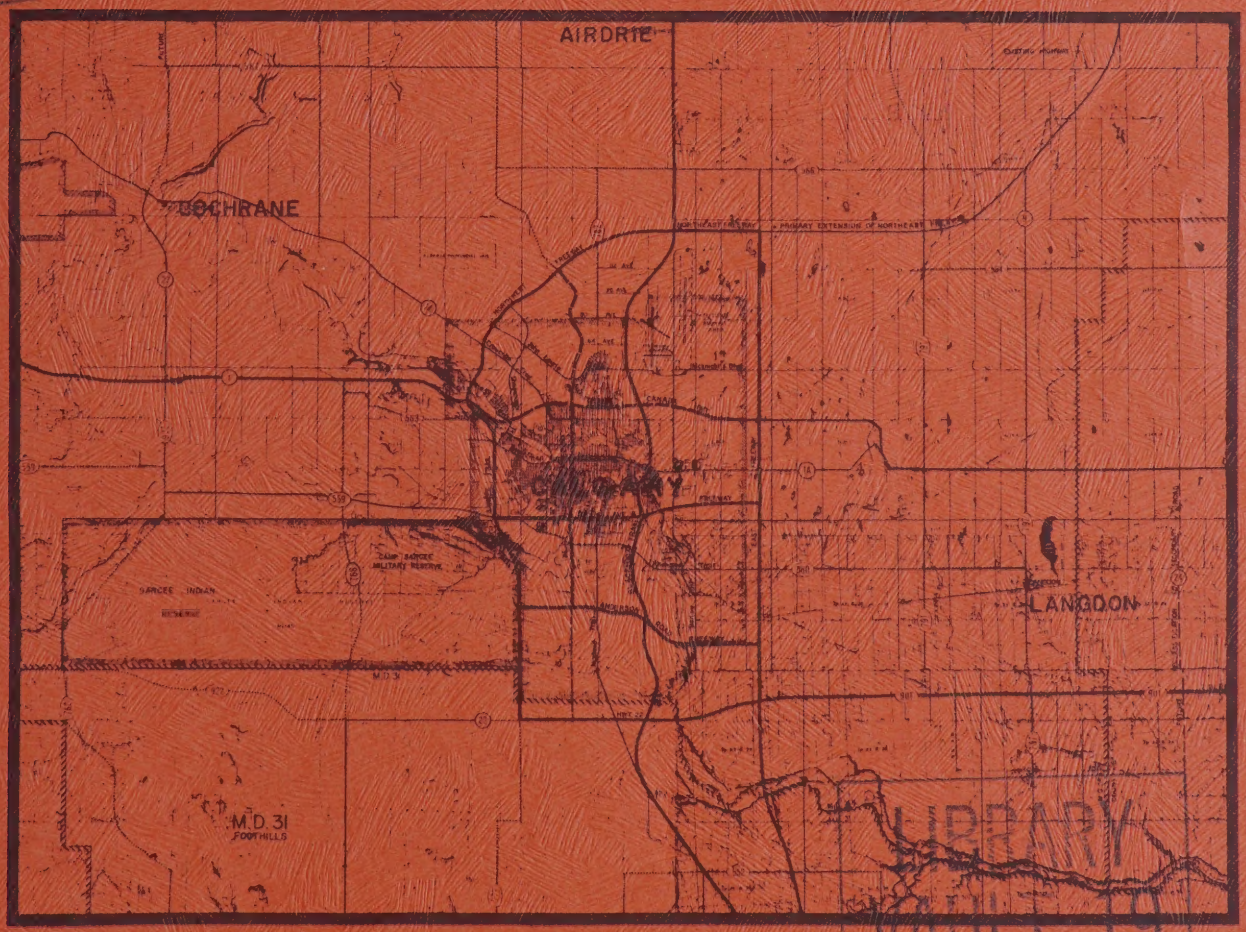

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Jan. 1974

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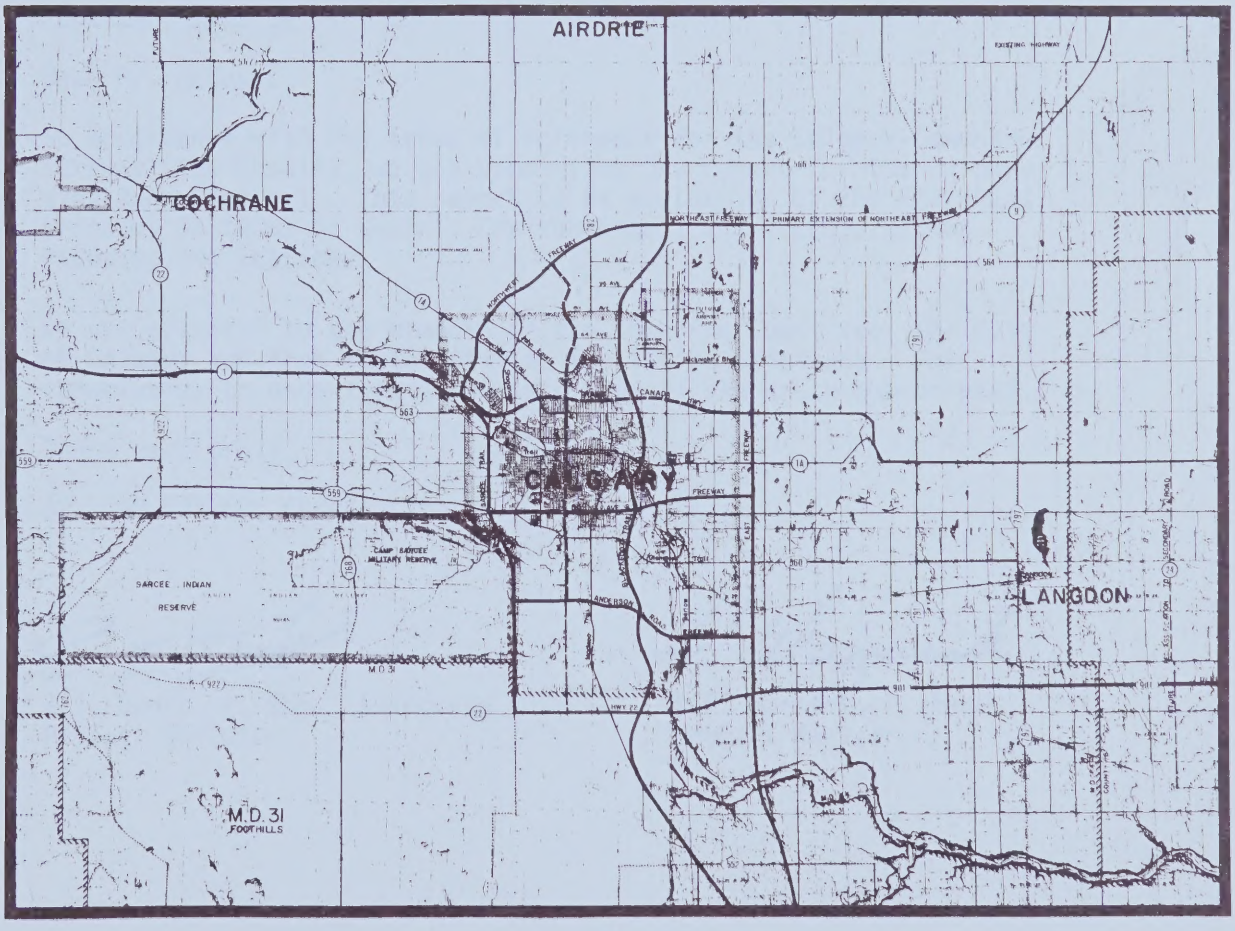
A Multi-Disciplinary Evaluation of the

CALGARY PARKWAY RING

for the
PROVINCE OF ALBERTA
DEPARTMENT OF HIGHWAYS AND TRANSPORT



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De Leuw Cather

CONSULTING ENGINEERS AND PLANNERS

January 28, 1974

Mr. V.E. McCune, P. Eng.
Deputy Minister
Department of Highways and Transport
Room 302, Highways Building
106th Street & 97th Avenue
Edmonton, Alberta

Dear Mr. McCune:

In accordance with the terms of reference for the Calgary-Edmonton Parkway Ring Studies, we are submitting the report for the Calgary Ring Road proposal. This report is an evaluation of the Ring Road proposal in terms of Social, Environmental, and Transportation Planning implications.

We are grateful to the members of the Steering Committee, the City of Calgary and Area Municipalities for their assistance. The opportunity to undertake this assignment is sincerely appreciated.

Yours very truly,

DE LEUW CATHER, CANADA LTD.

S.I. Donat, P. Eng., Associate
Project Director

R.P. Wozniak, P. Eng.
Project Manager

RPW:crl

TABLE OF CONTENTS

	Page
INTRODUCTION	1
Objective	
Scope	
Study Approach	
SUMMARY AND RECOMMENDATIONS	4
HISTORY OF RING ROAD	10
LOCATION AND NEED	12
Proposed Location	12
Function	13
Land Use	16
Traffic Considerations	18
Purpose and General Approach	18
Forecast For 1986-1990	20
Summary	22
Multiple Use of Corridors	23
Metropolitan Region Considerations	24
ENVIRONMENTAL IMPACT ANALYSIS	27
Soil Materials	28
Vegetation	29
Wildlife Capability	30
Surficial Aquifers and Sloughs	31
Surface Water	32
Visual Analysis	33
Soils - Agricultural Capability	34
Recreation Areas and Capabilities	35
Archeological Sites and Significant Natural Areas	37
Air Pollution	38
Noise Pollution	39
Susceptibility to Snowdrifting	41
Staging Considerations	43
Utilities	44
Cost	45

	Page
SOCIO-ECONOMIC ANALYSIS	47
Introduction	47
Objectives of the Ring Road	49
Socio-Economic Variables Related to the Ring Road Development	51
Costs	61
Benefits and Trade-offs	66
Some Comparative Situations	75
Conclusions and Guidelines to Policy	76

LIST OF EXHIBITS

	EXHIBIT NO.
KEY PLAN	1
PROJECT STUDY ORGANIZATION	2
COMPOSITION OF TEAMS	3
PROPOSED OUTER RING ROAD	4
RING ROAD FUNCTION	5
TRAFFIC SIMULATION MODELS	6
LAND USE PLAN	7
MAJOR POPULATION INCREASE DISTRICTS	8
MAJOR EMPLOYMENT INCREASE DISTRICTS	9
TRAFFIC NETWORK	10
TRAFFIC VOLUMES OUTER RING ROAD	11
MULTIPLE USE OF CORRIDOR	12
SOIL MATERIALS	13
VEGETATION	14
WATERFOWL LAND CAPABILITY	15
SURFICIAL AQUIFERS AND SLOUGHS	16
WATER COURSES AND DRAINAGE BASINS	17
LANDSCAPE ABSORPTION	18
AGRICULTURAL SOILS CAPABILITY	19
RECREATION AREAS AND CAPABILITIES	20
RECREATION POTENTIAL OF THE RING CORRIDOR	21
ARCHEOLOGICAL SITES AND SIGNIFICANT NATURAL AREAS	22
NOISE POLLUTION	23
TYPICAL BUFFER TREATMENT	24
SUSCEPTIBILITY TO SNOWDRIFTING	25
SNOWDRIFTING	26
UTILITIES	27
GAS AND OIL PIPELINES	28

INTRODUCTION

INTRODUCTION

Objective

In March, 1973, The Department of Highways and Transport retained De Leuw Cather to carry out a multi-disciplinary evaluation of the proposed Calgary Ring Road. This consisted of an overview of work carried out by the Department and an analysis of environmental, social and economic implications, and the identification of problem areas, if any, within the proposed Corridor.

Scope

There are two phases in the planning process for a transportation facility:

Phase I. Concept and Corridor Location

The concept and general corridor location within which transportation facilities may be located are analysed. A corridor is defined as a band of land approximately one-half mile in width.

Phase II. Route Location Within the Corridor

If the basic concept and general location are accepted, then details with regard to final alignment within the corridor and right-of-way requirements are determined. Public involvement is generally introduced in this phase.

Phase I - "Concept and Corridor Location" is covered in this Study. In addition to an overview of work by the Department, an analysis of a number of factors relative to a multi-disciplinary study has been carried out. These factors can be broadly grouped as follows:

Social
Economic
Environmental
Aesthetic

EXHIBIT 1
CTY. 17
MOUNTAIN VIEW
M.D. 44
ROCKY VIEW
M.D. 44
ROCKY VIEW
SARCEE INDIAN
RESERVE
M.D. 31
FOOTHILLS
STUDY AREA
0
8 Mi.
Scale

KEY PLAN

Study Approach

A multi-disciplinary project team was formed to work with and collect data from a number of other teams as indicated in Exhibits 2 and 3.

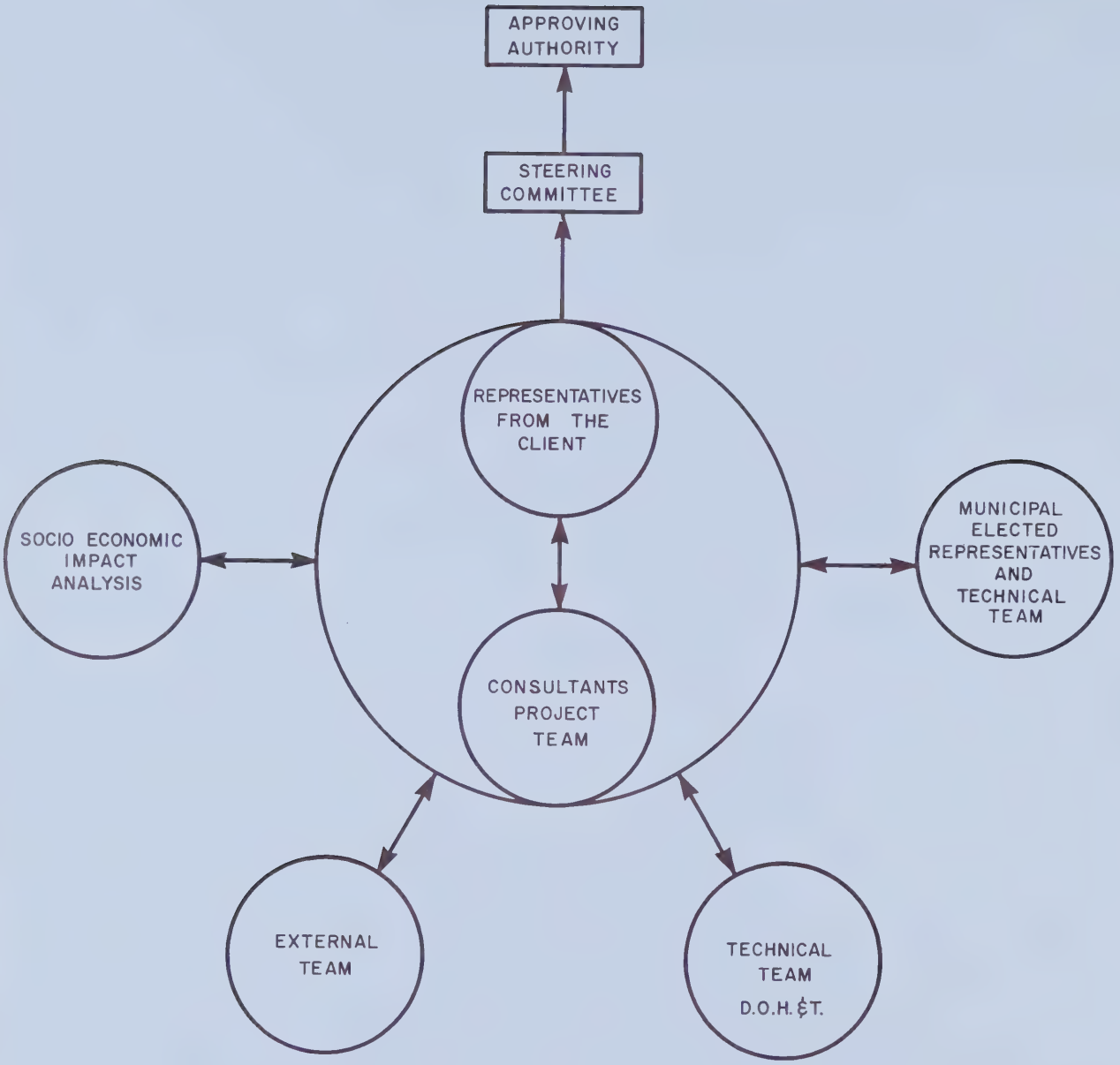
The project team included specialists in the following disciplines:

- Ecology
- Socio-Economics
- Landscape Architecture
- Parks and Recreation Planning
- Urban Planning
- Traffic and Transportation Engineering

During the course of the Study numerous meetings to collect data and/or receive comments regarding the concept were held with representatives from the following Provincial Government Departments, Local Taxing Authorities and Regional Agencies within the Study Area:

- Department of Agriculture
- Department of Environment
- Department of Highways and Transport
- Department of Municipal Affairs (Task Force)
- Calgary Regional Planning Commission
- City of Calgary Transportation Planning Department
- City of Calgary Parks and Recreation Department
- City of Calgary Planning Department
- Urban Evaluation Systems Steering Committee
- Municipal District of Rocky View
- Municipal District of Foothills
- Major Utility Agencies

The Study has been based on an examination and assessment of existing data, mapping studies and reports, and general information gathered at the above meetings. Generation of new data has been kept to a minimum, however additional traffic data has been produced so that traffic volumes projected for the Ring Road could be analysed and graphically illustrated.



PROJECT STUDY ORGANIZATION

MUNICIPAL ELECTED REPRESENTATIVES AND TECHNICAL TEAM

CITY OF CALGARY
M.D. OF ROCKYVIEW
M.D. OF FOOTHILLS

TECHNICAL TEAM

DEPT. OF HIGHWAYS & TRANSPORT
A. PLANNING BRANCH
B. BRIDGE BRANCH
C. CONSTRUCTION & DESIGN BRANCH

EXTERNAL TEAM

CALGARY REGIONAL PLANNING COMMISSION
DEPT. OF LANDS AND FORESTS
DEPT. OF THE ENVIRONMENT
DEPT. OF MUNICIPAL AFFAIRS
DEPT. OF AGRICULTURE
MAJOR UTILITY COMPANIES
A) CANADIAN WESTERN NATURAL GAS
B) ALBERTA POWER
C) CALGARY POWER
D) A.G.T.

PROJECT TEAM

DE LEUW CATHER, CANADA LTD.
L.W. DOWNEY RESEARCH ASSOCIATES LTD.

COMPOSITION OF TEAMS

A Steering Committee, consisting of one member from each of five Government Departments, was formed to oversee the work by the Study Team. The Study Team reported directly to the Steering Committee.

Members of the Steering Committee:

Mr. M.J. Dolinsky, P. Eng.
Chief Planning Engineer
Department of Highways & Transport

Mr. T.A. Drinkwater
Director, Parks Division
Department of Lands and Forests

Mr. F. Marlyn, Director
Task Force
Department of Municipal Affairs

Mr. G.B. Parlby, Head
Resource Economics Branch
Department of Agriculture

Mr. H.W. Thiessen
Assistant Deputy Minister
Department of Environment

SUMMARY and RECOMMENDATIONS

SUMMARY AND RECOMMENDATIONS

The need for the Calgary Ring Road was first identified in 1967 in the Calgary Transportation Study (CALTS). The location proposed at present by the Department of Highways and Transport is much the same as the CALTS proposal with the exception that the North Leg has been shifted northerly to allow for expansion of the Calgary Airport, and the East Leg shifted slightly to the east.

To rationally evaluate the Ring Road proposal, it is essential to analyse a large number of factors individually. In the final judgement, however, these factors must be jointly considered, and decisions made in terms of the implications of the total concept.

Transportation Engineering Considerations

A Ring Road positioned in its optimum location can play a vital role in the overall transportation system of a city and its surrounding region. It must be considered as a basic component of the urban transportation system rather than a separate entity with a justification of its own. In this light, the Ring Road is not to be viewed as an alternative to, say, rapid transit or bus systems, but rather as a mechanism for making those systems work more effectively. It has the potential of supporting other modes of transportation to the inner City, such as buses and rapid transit on radial routes. In addition, exclusive bus lanes or rapid transit can be accommodated within the Ring Road right-of-way.

The function that the Ring Road will serve is a fundamental question in the evaluation. Basically there are three functions in terms of traffic which the Ring Road will serve: Intra-Urban Traffic, Inter-Urban Traffic and By-Pass Traffic. The majority of traffic using the Ring Road will be intra-urban traffic. By-Pass traffic volumes will be relatively low, although it is significant that trucks would have the opportunity to by-pass the City. At the regional level, a Ring Road provides a means of integrating the urban transportation system with the primary and secondary regional and provincial highways.

It will provide a more balanced distribution of traffic on the penetrator roads leading into the inner portion of the City; and, at the same time, reduce noise and air pollution in the inner City and residential areas by providing more efficient routes to get to the same destinations. The redistribution function will also reduce to some extent the impacts associated with truck traffic. A Ring Road will attract certain commercial and industrial development to the periphery of the City, thus providing relief to the inner City in terms of traffic, pollution and the general environment. Very often, the redevelopment consists of land-use activities which historically have been associated with the inner City but which are no longer suited to that location.

The fundamental questions which have to be answered are: "Will the proposed Ring Road fulfill the traffic functions?" and "Will it provide the kinds of benefits to justify the initial expenditure to protect by purchase the necessary right-of-way?".

Multiple-Use Concept

An important attribute of the Ring Road concept is the inherent potential for integrating other uses into the total right-of-way, hence the "Multiple-Use Corridor" concept. The corridor should be sufficiently wide to provide for a highway facility, other modes of transport, utility lines, and environmental buffer zones as required due to adjacent land use. The result of combining rights-of-way for utility lines with the buffer zones is that enough land would be available for a number of other uses. If a large amount of land is in fact required for the buffer zone in conjunction with the development of a Ring Road system, then a host a recreational opportunities could present themselves. Accessibility to recreational areas would be improved by the Ring Road and the potential for implementation of the Parkway Ring would be greatly enhanced with a Multiple-Use Corridor in harmony with adjacent land-use.

Land Use

Present land-use plans in the City of Calgary are based on a 1990 population of 700,000. The City has undertaken a comprehensive review of its transportation system requirements. This is being conducted by a team named Urban Evaluation System (UES) Steering Committee. This committee is investigating the transportation requirements for a series of City growth alternatives to accommodate a future population of approximately 1,000,000. The degree to which the additional 300,000 population will increase utilization of the Parkway Ring will depend on where this further growth occurs. The UES Study, which is to be completed in 1975, is to provide information with regard to the direction and sequence of development in the Calgary area.

The Ring Road will definitely not be a barrier to urban expansion as such development could continue to reach and extend beyond the proposed ring as in the west and northwest. The important thing here, however, is to control this development to the best advantage and well being of all citizens. Close liaison will be required between Provincial and Local Governments in the interest of maximizing the benefits of changes in urban form stimulated by ring development.

Location

The Parkway Ring Corridor location in general terms is defined by physical and development controls, by city and airport expansion plans, by existing development, and by topography (especially north and south of the Bow River where location options are minimal). The location selected for the corridor is considered to be optimal in terms of the physical controls.

The attractiveness of the Parkway Ring to the urban commutor is however, proportional to its distance from his home and employment. Consequently the West and Northwest Legs will be heavily utilized,

whereas the other segments will serve more as regional roads and by-pass routes until such time as urban development reaches them or increases outside the ring. Expansion beyond the Parkway Ring is already outlined by the Strathcona and Crowchild Sector Plans to the West and Northwest respectively and preliminary planning is being carried out for neighborhoods totalling 180,000 population west of Highway 2, on either side of the Northwest Leg. Growth along the East Leg is expected to result in 100,000 population near this segment in about 10 years time.

All taxing authorities in the study area have adopted the Ring Road proposal and expressed strong support for it with the possible exception of the West Leg crossing of the Bow River at Bowness.

Impacts

Impacts with regard to the following factors have been analyzed: soil vegetation, wildlife, surficial aquifers and surface water, visual analysis, agricultural land, recreational areas, archeological sites, air pollution and noise, susceptibility to snowdrifting, staging considerations, utilities, and costs. The environmental impact analysis within the corridor indicates two serious problem areas on the West Leg; the crossing of the Bowness area, and the Elbow River Valley crossing. These highly sensitive areas will require additional work and study. Apart from these two areas the impacts varied from minimal to moderate with noise pollution and visual intrusion being the most serious concern. A depressed facility in conjunction with a "buffer zone" would have to be investigated in this respect at isolated locations. Special care and treatment should minimize visual intrusion on Glenmore Park, Nose Hill and Bowness. Other factors fairly significant without affecting the location within the broad corridor are: air pollution, and the effect on agricultural and recreation capability of the land.

Harmful effects created by the Ring Road can be reduced considerably by special treatments during design and construction.

Cost

The total estimated construction and land cost for the ultimate facility is between 170 and 190 million dollars, depending on the right-of-way width. The initial expenditure would be about 24 million dollars for land for the roadway (basic 350 ft. width) and interchanges, and about 22 million for construction of a 2 lane at-grade facility. The right-of-way required for "buffer zones" and/or multiple use would be additional to the basic cost.

Conclusion

It can be concluded that the various segments of the Ring Road have widespread differences in projected utility, and also have intense differences in impacts. The West Leg and the Northwest Leg which have the most serious environmental effects are also the segments which are most urgently needed in terms of traffic. Other segments which have minimal environmental effects, have low traffic projections and fall into the category of regional roads. Future land use developments and corresponding transportation requirements are now being studied, and will likely mean that at least some of these segments which are presently in a regional category will require future re-evaluation. Land use plans beyond 1990 may indicate a shift in concentration of urban development to place more emphasis on the Ring Road function, rather than the regional distributor function as presently envisaged with the 700,000 population projections. In the meantime the decision making process will have to accept this constraint and treat the various segments separately.

HISTORY of CALGARY RING ROAD

HISTORY OF RING ROAD

The concept of peripheral roadways in the City of Calgary is not new, although the proposed Outer Ring Road is the first facility of this magnitude to be considered for the City. The studies described below briefly outline the history of the current proposal.

1964 - 1966 - The Municipal Districts of Rocky View in 1964, and Foothills in 1966 completed studies for Regional and Secondary Roads. These studies were conducted by the Calgary Regional Planning Commission. Both studies showed that there was a need for roadway facilities in the City of Calgary periphery to provide continuity to the regional roads.

1967 - Although considerable study of a Ring Road had taken place prior to its completion in 1967, the Calgary Transportation Study first identified the present Outer Ring Road Corridor. This was a comprehensive transportation study carried out by the City of Calgary. Since its publication changes have taken place in population projections, land use and corresponding changes in traffic projections for the Ring Road.

1970 - The Department of Highways and Transport completed the Calgary Area Study. This study integrated the Provincial Primary and Secondary Highways with the Urban Road Network for the City of Calgary. The City of Calgary, adjoining Municipal Districts and the Calgary Regional Planning Commission participated in this study.

1973 - Urban Evaluation Systems Study. This study is being carried out at the present time by the City of Calgary. The study will enable the City to evaluate the transportation requirements for a series of alterative land uses. Transportation corridors and mode of transportation are to play an important role in evaluating future options for development. This study is to be completed in 1975.

Summary

The history of the Outer Ring Road for the City of Calgary is reasonably current. The basic issues in establishing the Ring Road have been to satisfy the transportation requirements of a growing urban area and to integrate the urban and regional road systems. Further study is currently being carried out with regard to future land use and transportation planning. The results of this study could have a substantial influence on transportation in and around the City.

LOCATION and NEED

LOCATION AND NEED

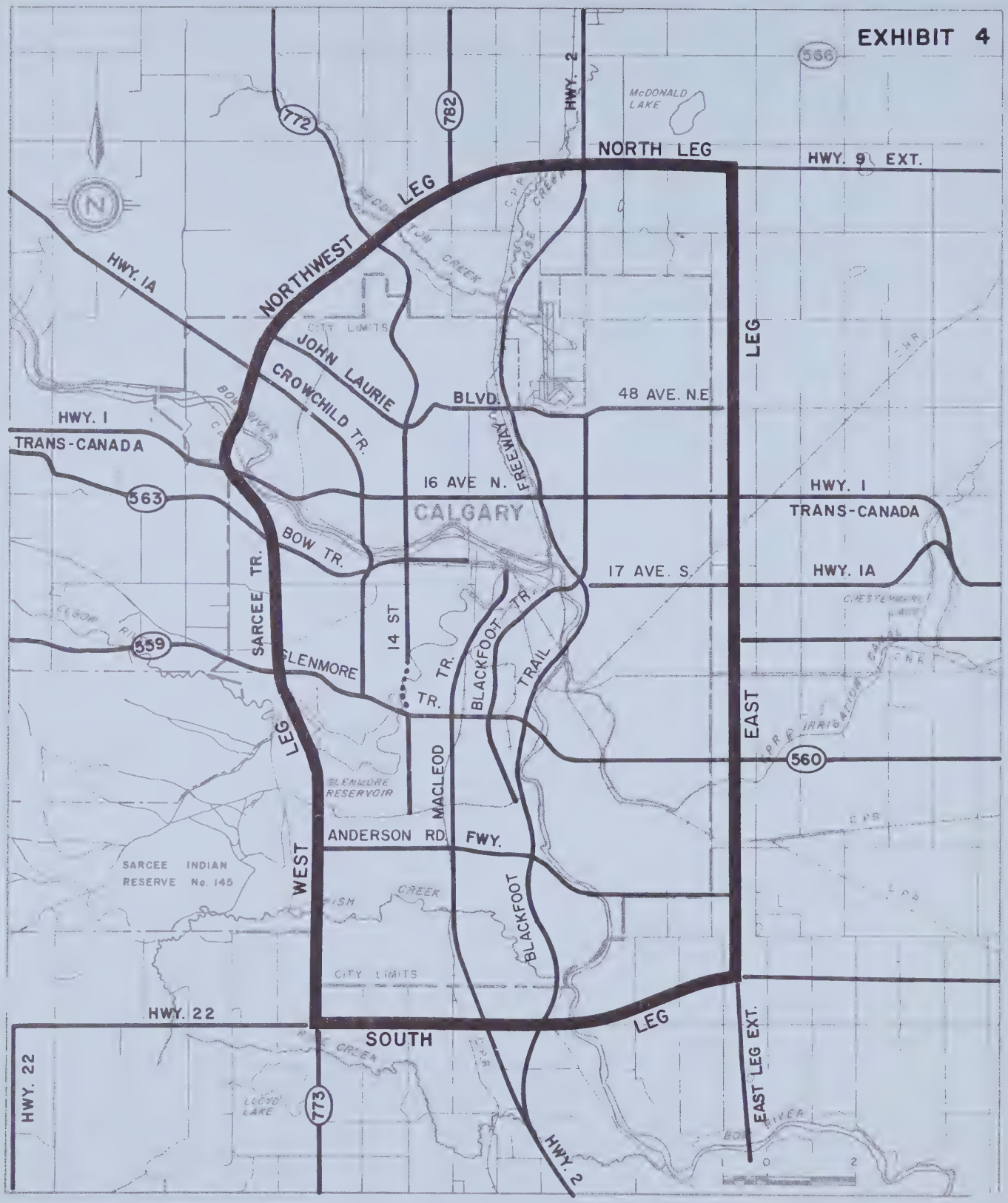
The terms location and need of a transportation facility are very closely interrelated. In the case of the Calgary Parkway Ring proposal it is essential to consider location and need simultaneously. It is extremely difficult to prove or disprove, in absolute terms, the need for a transportation facility. A wide range of variables have to be considered and in some cases conflicting data assessed. The need can best be examined by analyzing a number of factors which demonstrate the ability of the Ring Road proposal to serve the general public.

Proposed Location

The proposed corridor location has been examined in terms of physical and land use controls, environmental and socio-economic implications and intra-urban traffic. The environmental and socio-economic aspects are discussed in detail in latter sections of this report.

The location proposed for the Outer Ring Road has been derived from the Calgary Transportation Study (CALTS). The section of the Sarcee Trail from Highway 1 to Highway 22 of the CALTS plan has been retained. Highway 22 has also been retained as suggested in the CALTS report excluding the easterly portion which swings to the north about 1 mile to meet the Highway 901 alignment. Refer to Exhibit No.4.

The Northwest and Northeast Freeway has been shifted approximately 1 and 1/2 miles north of the location proposed in the CALTS report The shift has been made to satisfy the runway flight path restrictions imposed by the expansion plans for the Calgary International Airport. The westerly portion of the Northwest Freeway is controlled by severe topography and the Bow River Crossing.



PROPOSED PARKWAY RING ROAD

The East Freeway which was located along the East City Limits in the CALTS report has been moved 1/2 mile east to the first quarter section line outside the City. The City's development plan retained the 68th Street East allowance on the City Limits for an arterial street and the traffic projections indicate that the first freeway east of the Blackfoot Trail should be east of the City Limits.

Function of the Ring Road

The primary function of a Ring Road is to reduce the concentration of vehicle trips on arterial streets and improve the convenience of access to the different areas inside and outside the City. Its traffic function as considered in this study and illustrated in Exhibit 5, is to serve three trip types listed below in order of significance:

a. *Intra-urban trips* originating and terminating within the City.

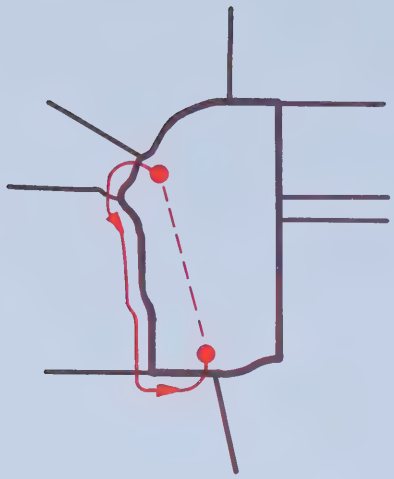
b. *Inter-urban trips* originating outside the City and terminating inside, and vice-versa.

c. *By-Pass trips* originating and terminating outside the City.

Intra-Urban Traffic

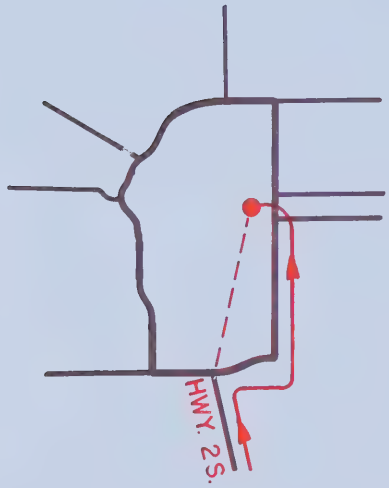
The major function of the Ring Road would be to initially accommodate intra-urban traffic. Therefore, its usefulness and realizable benefit is dependent on its nearness to the trip origins and destinations. This implies that the closer in the roadway, the higher would be its usage, and consequently the greater the reduction of traffic on major arterials in the inner city. Conversely, the farther away it is from development, the lesser will be its utility. The latter situation is evident in the case of the Ring Road in Winnipeg, where traffic volumes are very low because of the considerable distance from development. This does not say, however, that locating segments of the corridor farther out would be wrong, but it implies that benefits from these segments would not be realized until equivalent development reached the corridor.

EXHIBIT 5



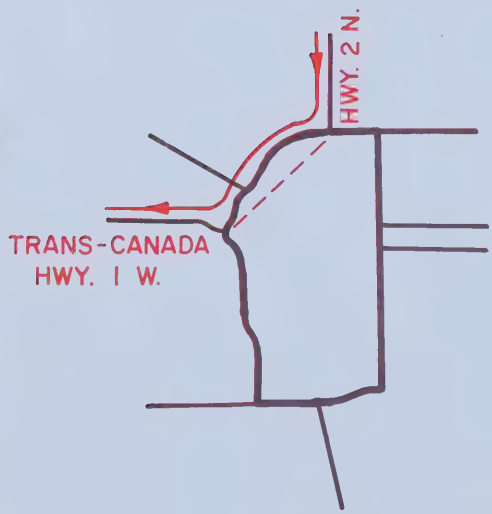
A

INTRA-URBAN



B

INTER-URBAN



C

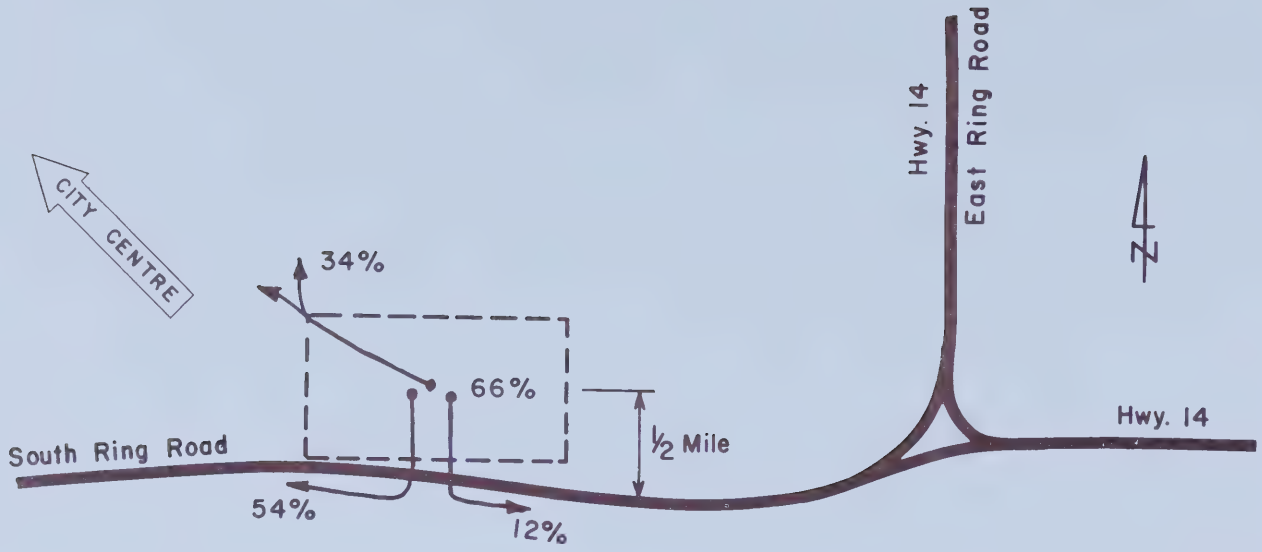
BYPASS

RING ROAD FUNCTION

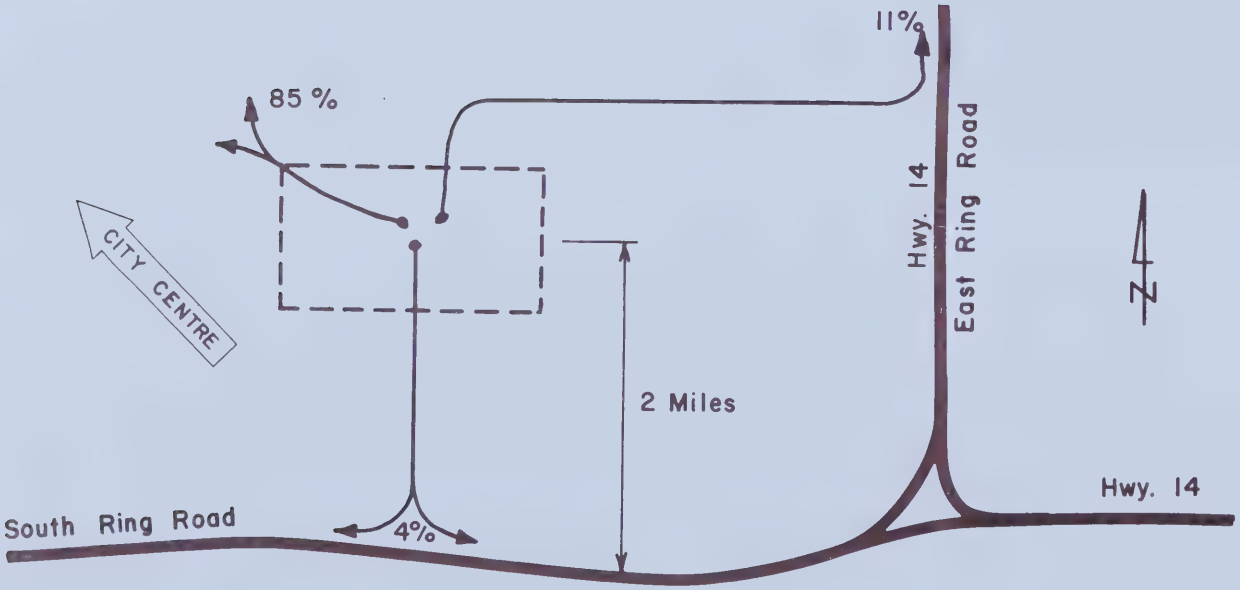
Intra-urban trips, in the case of Calgary, are by far the most significant because nearly all of the Metropolitan Region population lies within the proposed corridor as well as major industrial and commercial development. Representative intra-urban trips would be by people living within the City and working and/or shopping within the City. Intra-urban trips would be significant on the segment of Sarcee Trail from Anderson Road through to John Laurie Blvd. In the south portion of the City, Anderson Road Freeway would better serve the intra-urban trip function than Highway 22. The Blackfoot Freeway and John Laurie Blvd. would serve this function in the east and north respectively.

The relative usefulness of the Ring Road for trips from inside the Ring is illustrated by the two traffic simulation models for Mill Woods, a new residential sub-division in the City of Edmonton. For a neighbourhood centred one-half mile from the proposed Ring Road 66% of drivers would typically use the Ring Road. For a neighbourhood centred two miles from the proposed Ring Road utilization drops to 15%. (See Exhibit 6)

Inter-urban trips originate in the outlying areas, such as Airdrie, Okotoks, Cochrane, etc., and are mainly work trips for people residing in these communities and working in the City. Inter-urban trips are largely a function of the population living outside the immediate area of the City. In the Calgary area existing communities are located considerable distances away from the City and are not in the category of urban satellite communities. Therefore it can be stated that the Ring Road function to serve Inter-urban trips will not be significant based on existing development and the available future land use plans.



NEIGHBOURHOOD CENTRED 1/2 MILE FROM RING ROAD



NEIGHBOURHOOD CENTRED 2 MILES FROM RING ROAD

TRAFFIC SIMULATION MODELS

Bypass trips are predominantly related to trucks. Calgary is a major terminal for truck trips, and thus bypass truck trips are not very significant. The present major bypass movements are east-west on the Trans Canada Highway, Highway No.2 north to west, and north-south on Highway No. 2. Due to the additional travel distance that would be required to utilize the Ring Road as a bypass it cannot be considered as a bypass route for Trans Canada traffic. The Northwest Freeway would be an attractive bypass route for traffic between Highway No.2 north and Highway No. 1 west of Calgary. With development of the South Extension of the East Freeway, the East Freeway would provide a convenient bypass route for north-south traffic. The function of the Ring Road for bypass trips will not be significant.

Conclusion

The main function of an Outer Ring Road is to reduce the impact on the inner portion of the City. In cities where Ring Roads have been built in proximity to developed areas (West and Northwest Legs) heavy traffic volumes have been attracted to them, which would otherwise utilize local and residential streets. On the other hand if a Ring Road is too far removed from the built-up areas, (South, North and East Legs) it will not attract urban traffic and therefore its' function as a distributor for intra-urban traffic is not fulfilled.

Land Use

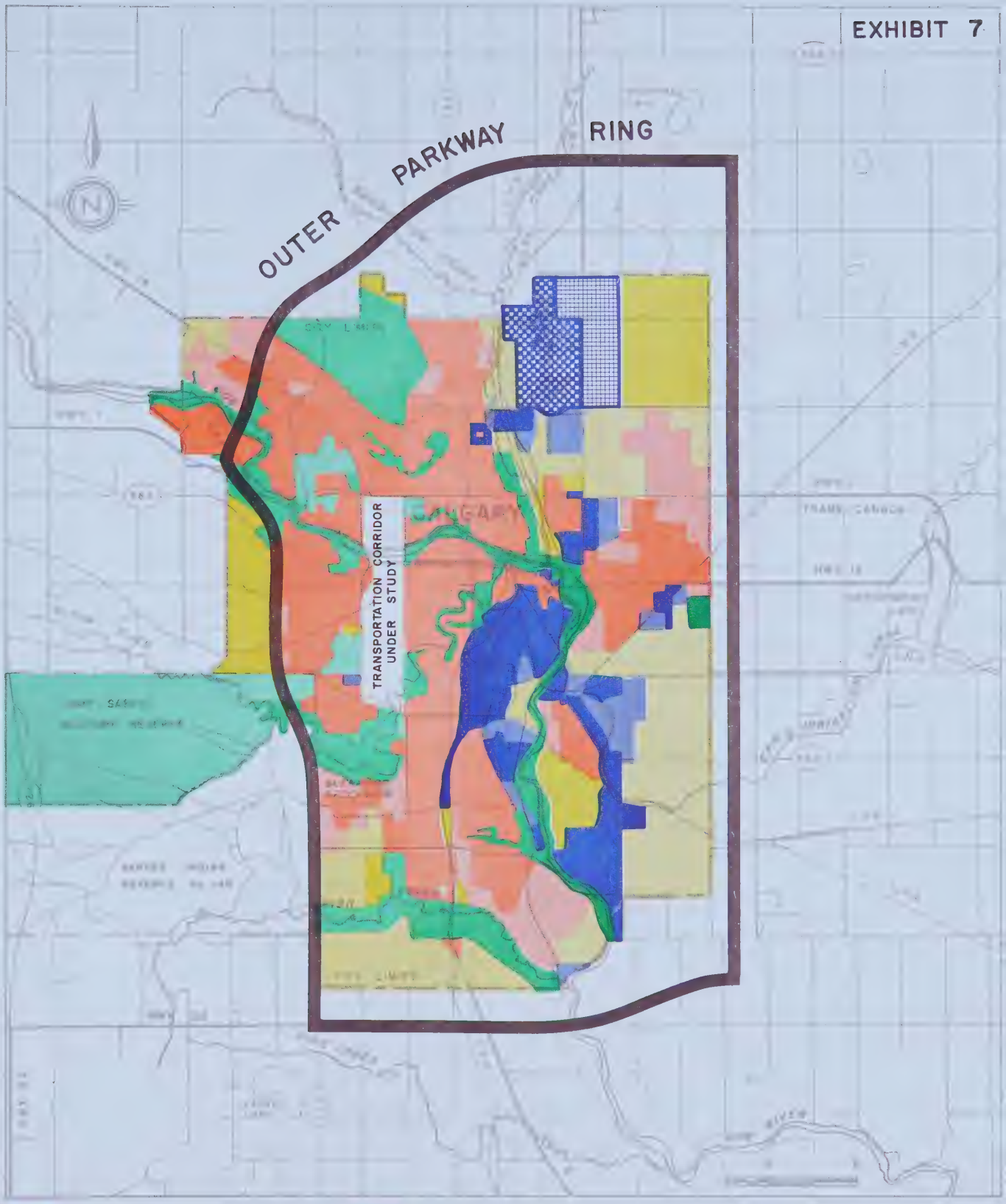
The generalized land use for the year 1978 is illustrated in Exhibit 7. The major residential growth is planned in the northwest and southwest areas with some expansion to the east and northeast. The industrial areas are essentially along the eastern periphery of the City and future expansion would be in the southeast area.

Exhibit 8 illustrates the traffic districts that show significant increases in total population between 1973 and 1986-90 when the total population reaches 700,000. Also shown is the approximate location of the Outer Ring Road. As is quickly appreciated, except for the north-west quadrant, all the proposed future residential development to 1986-90 takes place within the Ring. A large increase in population occurs in the south-west and north-west quadrants. The area to the east and south of the airport also experiences a large growth. Little or no development is expected to occur outside of the Ring and hence traffic would not normally be intercepted by the Ring, but would have to backtrack to gain access.

Exhibit 9 illustrates the districts proposed for major employment increase. Where these districts coincide with major residential development, the increase in employment is generally associated with service employment in schools, small convenience shops, etc. This type of employment is not usually associated with peak hour traffic flow problems. The only exception would be the traffic associated with the University. The other areas of significant employment increase are the Central core districts 1,2, 3, and 4 where 24,000 new jobs are expected. The industrial areas in districts 8, 9, and 10 and 20 account for another 23,000 jobs. The airport and other opportunities in district 68 account for 3,300 new jobs.

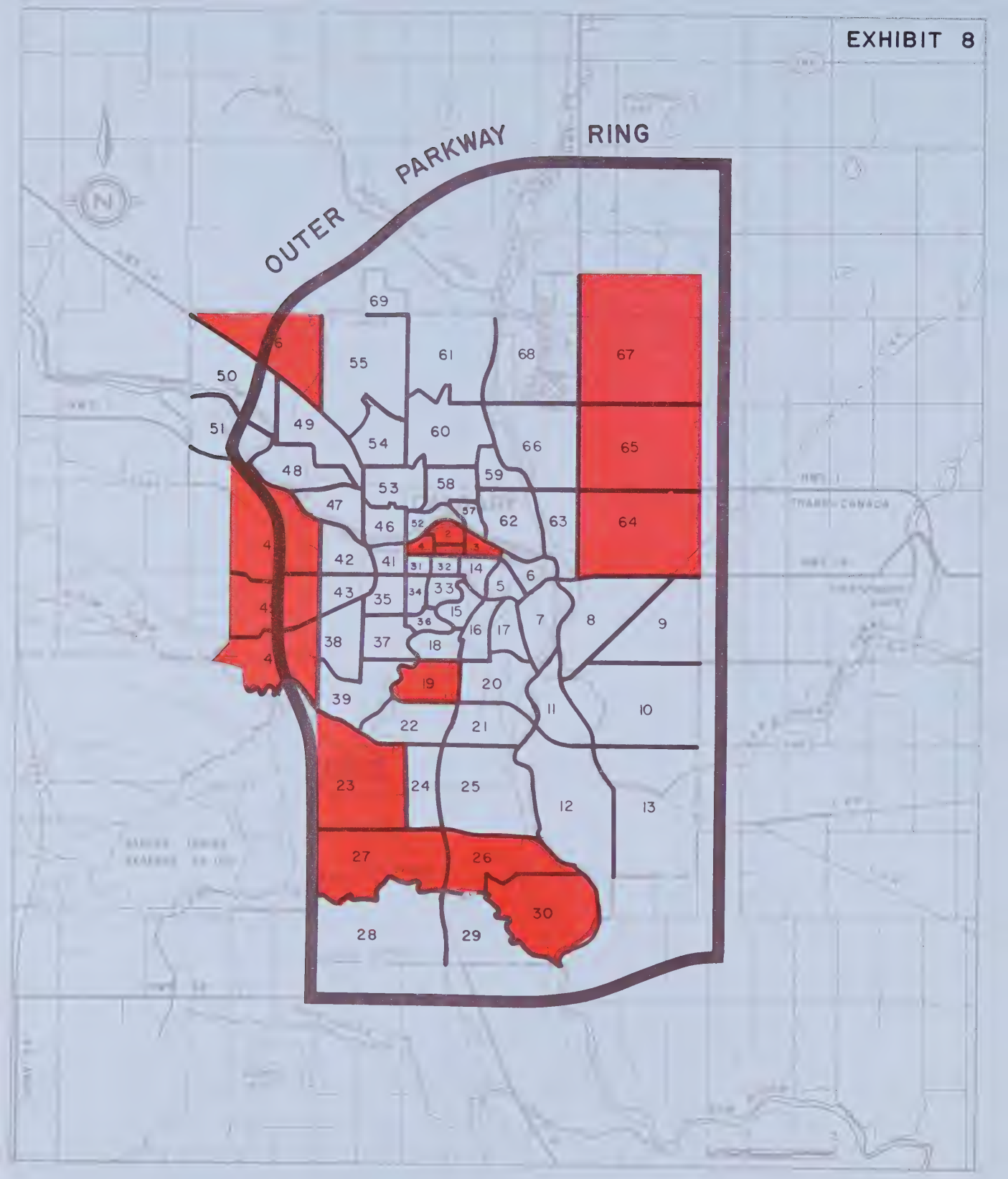
Most of the jobs in the industrial and CBD areas will attract employees from the main residential areas. The jobs in many of the residential areas will tend to be filled by people in that general quadrant of the City.

EXHIBIT 7



LAND USE PLAN

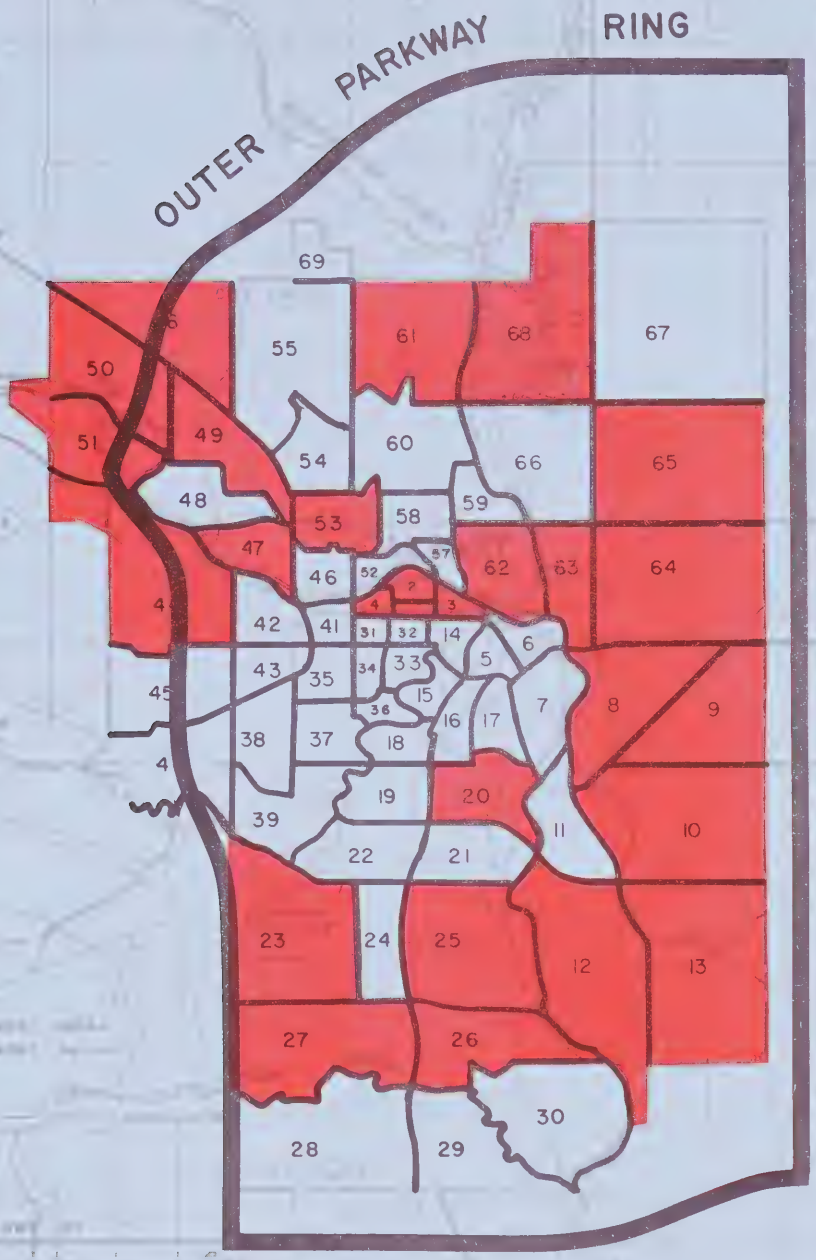
EXHIBIT 8



INCREASE DISTRICTS

MAJOR POPULATION INCREASE DISTRICTS

EXHIBIT 9



INCREASE DISTRICTS

MAJOR EMPLOYMENT INCREASE DISTRICTS

Consequently a large movement of people can be expected from the north-west and south-west quadrants to the central area. In addition, there would appear to be strong travel demands to the industrial areas, but not of the same magnitude as the desire for trips to the central area.

What is evident upon examining the population and employment distribution is that little use would be made of the Outer Ring in its proposed location for work trips, except in the north-west quadrant and to a lesser degree in the south-west quadrant, where the Outer Ring could perform a distribution function and provide an additional river crossing. Traffic could also use the Outer Ring Road to gain access to the most direct penetrator to the central area. As well, trips between the two large residential growth areas in the north-west and south-west and their shopping and educational facilities would be expedited and diverted from the central area traffic routes.

The location of future residential areas to accommodate the growth from 700,000 to 1,000,000 would be important when assessing possible future use of the Outer Ring Road. It would appear from the existing and proposed patterns, that the future growth would be accommodated to a large extent in the south-west and north-east quadrants. As well, areas of increased density along any proposed rapid transit facility can be expected to develop. There is a large reserve of urban land along the eastern city boundary as well. The north-west quadrant would have little land for housing left within the city boundary.

If development is allowed to cross the Outer Ring in other areas, say to the north and to the north-east and east, then the increased attractiveness of the Outer Ring to these people would encourage its use.

Traffic Considerations

Purpose and General Approach

The object here has been to review available transportation planning information for the City of Calgary and to comment on the impact of an Outer Ring Road on the overall transportation network for the City.

The approach has been to meet with appropriate representatives from both the City and the Province and to identify and collect available background data. These data were then reviewed and an assessment of the expected role of the proposed Outer Ring Road was made. The traffic assessment has been, of necessity, largely based on judgement and experience as no detailed analysis of the source material was made. This assessment is only one of a series of steps in the the evaluation of the proposed Ring Road.

The City of Calgary commissioned a comprehensive transportation planning study in 1964. This study (Calgary Transportation Study) was completed in 1967. The most important feature of the CALTS plan was a major freeway network, which was supplemented by a rapid transit facility in two corridors. The recommended network and supporting data were available to the review team.

Subsequently, a revised target year (1986) forecast of population was prepared. The original 1986 CALTS population of 775,000 was decreased to 700,000 although the employment was left essentially unchanged. The revised CALTS population estimates were distributed to the same traffic districts used in the CALTS study. The City of Calgary has just recently proposed a revised future population

estimate. This new estimate indicates that a population of 700,000 is likely by 1990.

Various studies since the original CALTS study have produced modifications in the original freeway network and a revised network plan was prepared by Calgary officials with a slightly different alignment for some of the major facilities. This most recent network was used in a new traffic assignment using trip data produced from the 700,000 population estimate. The assignment was a stochastic, multiple-path assignment using origin-destination data generated from a population of 700,000 and the results made available to the review team. The assignment was based on the following:

- minimum freeway network
- modal split favouring transit in certain corridors: the assignment assumed a rapid transit network as shown in the CALTS report
- land use projections from the CALTS report up-dated to reflect the changes in total population

This assignment was the major source of traffic information used in the review. Some population shifts for certain districts were required and the results of the assignment had to be manually adjusted accordingly in these districts.

Simultaneous with this current overview of the Ring Road concept, the City of Calgary is undertaking a comprehensive review of the transportation system requirements for the City. This latter review, being conducted by a team named Urban Evaluation System Steering Committee, will investigate the transportation requirements for a series of alternative land use schemes. Various traffic and land use models will be used to test the alternatives. The UES team is using base year statistics from a 1971 O.D. survey as well as other recent and current studies on commodity movements. Data from these other studies are not available for this review.

Traffic Forecast for 1986-90 with a Population of 700,000

The major facilities included in the traffic network used for the assignment by the City of Calgary are shown on Exhibit 10.

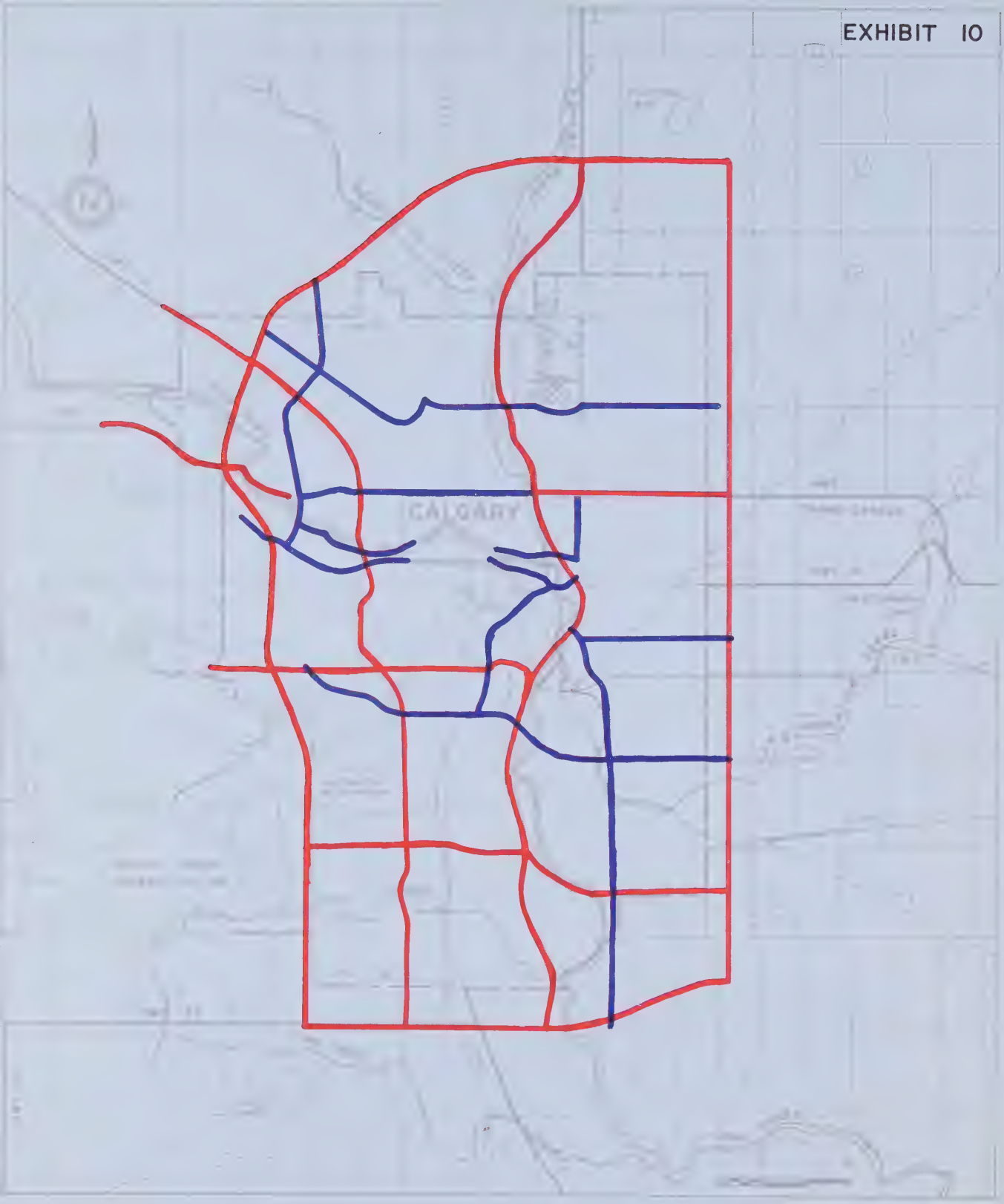
Exhibit 11 illustrates the major two-way ADT traffic volumes associated with the assignment. No comparative assignment was available that excluded the Outer Ring Road as a network element. However, as can be seen from the assignment, except for the north-west quadrant, the future estimated volumes on the Ring Road are low. These volumes included forecast truck trips as well as external traffic.

The areas of large residental development in the north-west have excellent access to the Outer Ring. In the south-west, the proposed residential development abuts the Ring Road. Volumes between 20,000 vehicles per day and 30,000 vehicles per day were recorded on the Ring between Highway 1A and Highway 1. This volume increased to over 70,000 vehicles per day west of Strathcona Heights along the Sarcee Trail. South of 50th Avenue S.W. the volume dropped to 48,000 vehicles per day and below 82nd Avenue to 23,000 vehicles per day. South of Anderson Road the volume dropped to 9,100 vehicles per day. Between Fish Creek and the southern leg of the Ring Road the ADT was 3,500 vehicles.

The Western Leg of the Ring (Sarcee Trail) would appear to provide an essential service as it is doubtful that the traffic volumes assigned to it could be carried on alternative facilities such as the 14th-24th Freeway, which already has forecast assigned volumes of up to 125,000 vehicles per day just north of the Glenmore Trail. The Sarcee Trail crossing of the Elbow River would require a very sensitive design treatment to minimize the impact on the existing and proposed park development.

North-South movements are strong and are accommodated by the

EXHIBIT 10

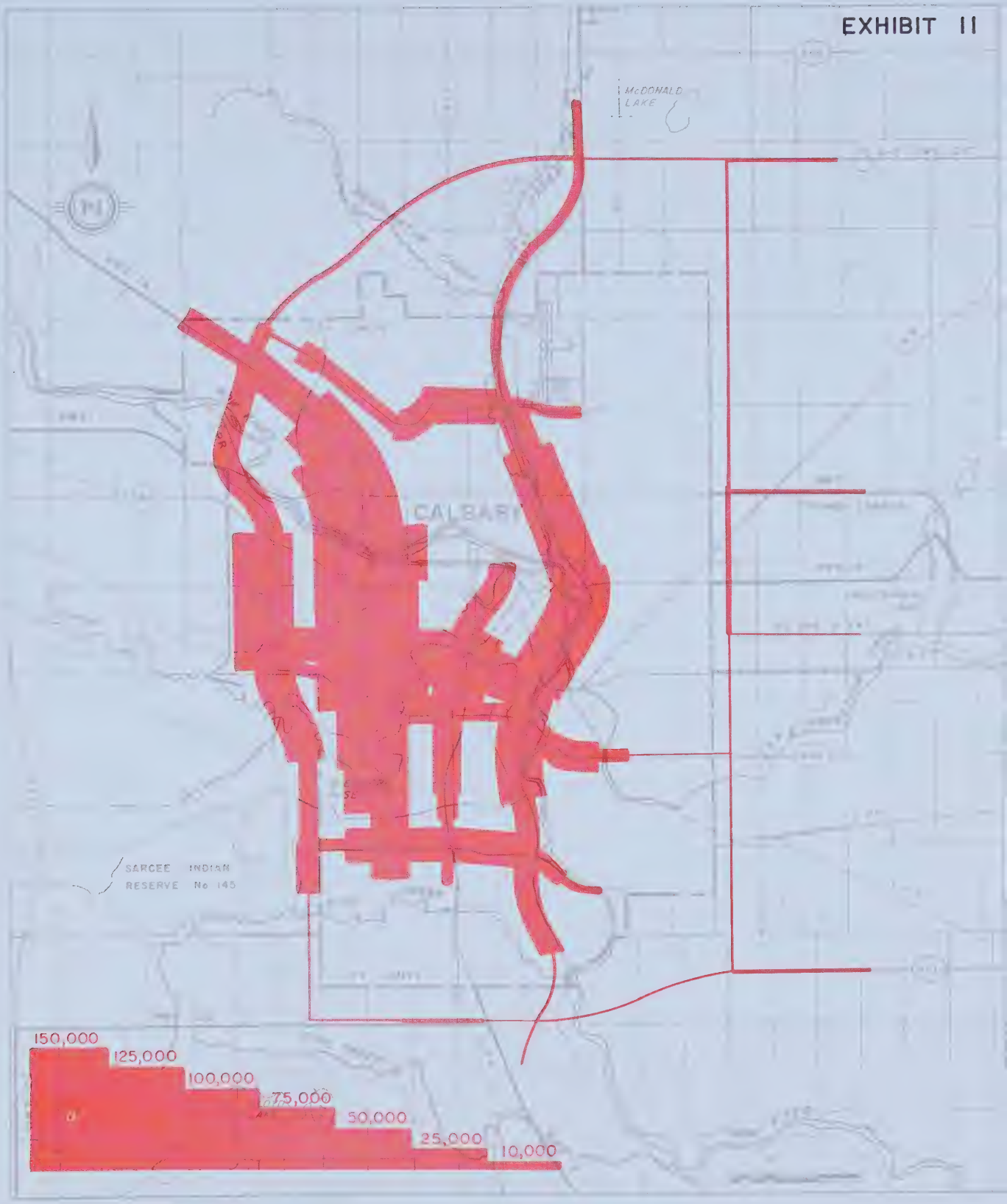


FREEWAYS

EXPRESSWAYS

TRAFFIC NETWORK

EXHIBIT 11



ANNUAL AVERAGE TRAFFIC VOLUME (BOTH DIRECTIONS)

TRAFFIC VOLUMES WITH OUTER RING ROAD

Western Leg of the Ring, the 14th-24th Street Facility, the Macleod Trail and the Blackfoot Trail. North-South movements east of the Blackfoot Trail are small.

Most of the East-West movement is accommodated on John Laurie Blvd., Trans-Canada Highway, Memorial Drive, 50th Avenue South, the Glenmore Trail and Anderson Road. Very little demand for east-west traffic exists at either the northern or southern extremities of the study area in the vicinity of the north and south legs of the Outer Ring Road. Consequently, the Outer Ring Road volumes on the southern, eastern and northern legs, are quite low.

From the Blackfoot Trail in the north, along the Western Leg and south to the Fish Creek, the ADT volumes indicate that the Outer Ring does perform a necessary function. In the south, north-east, there are other facilities that no doubt could accommodate the small volumes forecast for the Outer Ring.

The Outer Ring can be expected to have little influence as a distributor of trips headed for the Central Study Area. Most trips would use an Inner Ring (24th Street, Glenmore Trail, Blackfoot Trail and the Trans-Canada Highway) for this function. In fact, the Inner Ring and the connecting freeways would be used to accommodate the majority of the crosstown trips as well. For example, movement from areas west of the University to the industrial area in districts 8, 9 and 10 would tend to use Crowchild Trail, Trans-Canada and Blackfoot Trail, rather than the Outer Ring to the north of the airport. Other network elements may be favoured to form an Inner Ring such as John Laurie Blvd. for the Trans-Canada, and Anderson Road for the Glenmore Trail.

The vehicular volumes forecast for a population level of 700,000 were obtained from a person trip forecast after making allowance for auto occupancy and modal split to transit. The modal split was similar to

that used for CALTS and represents a fairly strong orientation to transit for trips to the Central Study Area. The existing (1964) transit modal split (work trips) to and from the downtown study area is 29.6% and this is forecast to increase to 41.9%. The overall modal split to transit (work trips) was forecast to decrease from the 1964 level of 18.9% to 14%. This is an area of debate as current experience in many cities reflects a strong comeback for transit. Even with such an occurrence in Calgary, there is little doubt that it would virtually have no effect on the traffic volumes projected for the Outer Ring. At best, the influence of the rapid transit would be to lessen the heavy vehicular travel on the 14th-24th Street - Crowchild Trail Freeway.

Traffic Summary

The traffic assignment based on 700,000 population, corresponding to a target year around 1990, indicates that the Outer Ring from Blackfoot Trail in the north, along the Western Leg, performs a necessary function.

All other portions of the proposed Outer Ring Road carry less than 8,000 vehicles per day, and as there are existing facilities in the corridor of the Outer Ring, it would appear that no new or greatly upgraded facilities would be required within the proposed 700,000 population level.

The internal modal split to transit would have little influence on the volumes assigned for the Outer Ring Road. With no rapid transit, vehicular volumes could be expected to increase on the western leg (Sarcee Trail).

It would appear that for the interim period the Ring Road would consist of the West and Northwest Legs, Anderson Road for the South Leg and Blackfoot Trail Freeway as the East Leg.

Additional residential development in the North-East coupled with industrial development where planned would indicate increased use of the Barlow Trail and some increased use of the eastern section of the Outer Ring.

Multiple Use of Corridors

The basic principle of the multiple use corridor concept is the joint utilization of right-of-way for a number of purposes. The Ring Road, in addition to serving as a facility to move traffic, has a number of other equally important benefits which can be realized through the multiple use of the corridor. Because environmental buffer zones would be required in a number of areas between the roadway and adjacent development to shield against noise and/or visual intrusion, the additional right-of-way thus provided could be utilized for various purposes. The width of the buffer zones would depend on the adjoining land use and the design treatment of the roadway. In general terms, more right-of-way would be required in the vicinity of residential development than in commercial or industrial development.

There is a demand for additional rights-of-way for major utility corridors in the Calgary Area. The major utilities, such as power, water, gas and oil pipelines may individually require wide rights-of-way. With proper coordination, the land used for utilities could ideally be integrated into the multiple use of the roadway buffers.

The center median of the Ring Road will be adequate in width to accommodate other modes of transportation. At the same time, parking areas could be provided at intervals along the corridor in conjunction with possible bus or rapid transit service to the downtown area.

EXHIBIT 12

MULTIPLE USE CORRIDOR

Perhaps one of the most important considerations of the multiple-use concept would be parks and recreation. It has been indicated by the Department of Lands and Forests, Parks Division, that there is no inherent demand pressure for recreation facilities to be located great distances from places of residence. However, the demand for recreation is there, and such development should be focused on serving the demand at or near its source. The trend now is to locate and develop the recreation areas where the people are, i.e., near the major Metropolitan Areas. When considered in light of the multiple-use concept, one of the significant impacts of the Ring Road would probably be the impetus it would create for regional parks in the Calgary region periphery. An opportunity would be presented to tie the existing City Parks to provincial and regional recreation systems beyond the Ring Road. It can be concluded that the direction, the nature and the scope of parks and recreation planning in the region will be significantly influenced by the Ring Road and the Multiple-Use Concept.

Some other uses which may be considered for the multiple use of right-of-way are industrial, commercial or institutional developments, conservation areas, preserves and trail systems. Careful planning and research would have to be carried out to ensure the practicality of various combinations of uses. During the planning stages all concerned Government Departments as well as the City and adjacent municipalities and utility companies should be involved.

Metropolitan Region Considerations

The Ring Road would provide an efficient means for distribution of Urban and Regional traffic. At the outset of this Study, meetings were held with Councils or Committees of Council of the Taxing Authorities in the Study Area. The purpose of the meetings was to receive input from the various jurisdictions with regard to the Ring Road concept. In general, there was strong support by representatives from the adjoining Municipal Districts of Rocky View and Foothills. There were two main

reasons for this support:

1. A significant portion of the population residing in areas outside of the corridor work in the City. And thus the Outer Ring Road is important from the point that it provides a distribution of access to and from the City.
2. Access from rural areas to market agricultural products within the City would be improved.

These studies indicated that there was a requirement for a distributor facility at the City of Calgary periphery. The Outer Ring Road would be the most efficient means of fulfilling this requirement.

In discussions with the various Departments of the City of Calgary there was general agreement with regard to the concept, however, the following points were raised:

1. The Blackfoot Trail Freeway, if continued to the South would serve as the East Leg of the system for many years.
2. A lower standard facility be provided to link the Sarcee Trail with the Northwest Freeway or other major east-west arterials in the north part of the City. It was realized that this would not be a long term solution.

Although discussions were held with a relatively large number of municipal and elected representatives from the various jurisdictions, it is suggested that in the follow-up stages public involvement be initiated to ensure the acceptability of the concept and the location. In the areas of the Glenmore Valley and Bowness full scale public participation should definitely be introduced.

Summary

Based on present land use plans and traffic projections it is apparent that segments of the proposed route are too distant from concentrated urban development to attract urban traffic and would therefore be under utilized. On the other hand the traffic projections for the West Leg indicate high utility by intra-urban traffic, and this segment should provide a significant relief for traffic flow in this part of the City. The right-of-way should be protected for the West Leg and the Northwest Freeway to Highway No.2. Decisions regarding protection of right-of-way for the East Leg should be deferred until the Urban Evaluation Systems Study has been completed and land use beyond the year 1990 has been established. The South Leg and the Northeast Freeway are subject to the development of connecting regional roads. Since the City is among the fastest growing in Canada, it can be stated that the projected 1990 population of 700,000 is not a fair criterion by which to evaluate the Ring Road. The question, however, remains - where will the population above 700,00 be located?

The multiple-use of the corridor should be seriously considered for the segments that will have the right-of-way protected. The potential success which can be derived depends largely on the degree and means of implementation of the multiple-use considerations and the integration of this corridor with adjacent land uses.

ENVIRONMENTAL IMPACT ANALYSIS

ENVIRONMENTAL IMPACT ANALYSIS

An environmental analysis has been carried out for the recommended location of the Ring Road Corridor and the results are presented in this section.

Elements which have been analyzed fall into four basic categories:

Natural Environment
Man-Made Environment
Transportation Engineering
Socio-Economic Environment

The Socio-Economic implications are covered in the following chapter. Under the Natural Environment, potential impacts of the proposed Corridor have been examined with regard to soil, vegetation, wildlife, surface water, water quality and landscape absorption.

The Man-Made Environment includes potential impacts with regard to existing and proposed land uses, archeological and natural areas, noise and air pollution.

Transportation Engineering involves elements such as susceptibility to snowdrifting, staging considerations, utilities and costs.

Many of the items are not quantifiable and, therefore, extensive use has been made of a mapping technique to provide a visual illustration of the impacts. The exhibits have one characteristic in common: The darker the tone the more significant is the control exercised by the item.

Soil Material and Roadside Pollutants

Soils in the Calgary area are generally well drained. Exhibit 13 presents the information on soil texture. Due to the dry climate and frequent winds, the soils are somewhat prone to erosion. Soil management techniques can prevent erosion and maintain the soils in the Ring Road Corridor.

Pollutants of the soils near a highway include oils and greases, lead from exhausts and herbicides and salt from road maintenance. Oils and greases are not generally a major pollutant, although they appear in run off from paved residential areas and contribute to water degradation. It is not likely that oil and grease would circulate in soils via ground water movement.

Lead from motor exhausts can be a serious pollutant. The presence of lead in exhaust has increased dramatically and now is common in urban soils, dust, air and snow. It is generally a surface contaminant and as such can be deposited upon crops, including animal forage. It is usually not trans-located through plant root systems. Most of the lead from exhausts is deposited within 300 feet of a highway, thus falling within the proposed corridor. This pollutant should be given strong consideration in the development of multiple corridor use, for example, picnic areas.

Herbicides and road salt can be carried into local watersheds. Little is known regarding the rates or distances of such movement although certain herbicides are much more stable than others, and if properly applied may not have widespread effects.

Conclusion

With environmentally-guided design, construction and maintenance, there should not be any important impacts from soil erosion or maintenance practices.

EXHIBIT 13

SOIL MATERIALS

Vegetation

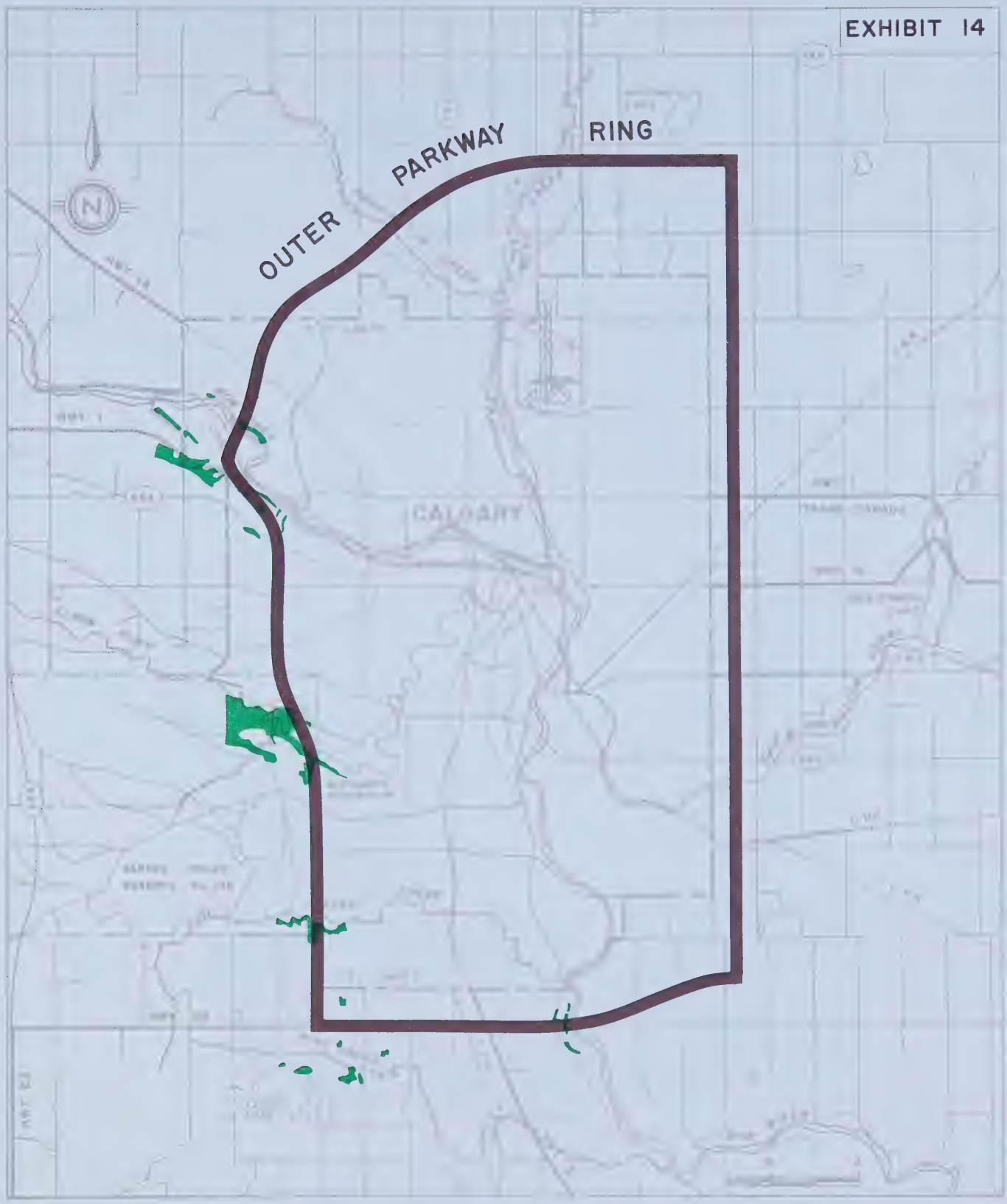
Exhibit 14 indicates the forested areas in the proposed corridor. These areas are very scattered and sparse; no stands are large or dense and the trees are mainly deciduous, although clumps of evergreens do exist in the Elbow River Valley.

The trees may have value for residential or park areas and for reducing erosion in gullies and should be protected for these reasons.

Conclusion

There would be a loss of forest vegetation through the Elbow River Valley. In the determination of the final roadway alignment through this area, consideration should be given to avoiding dense stands of trees.

EXHIBIT 14



VEGETATION

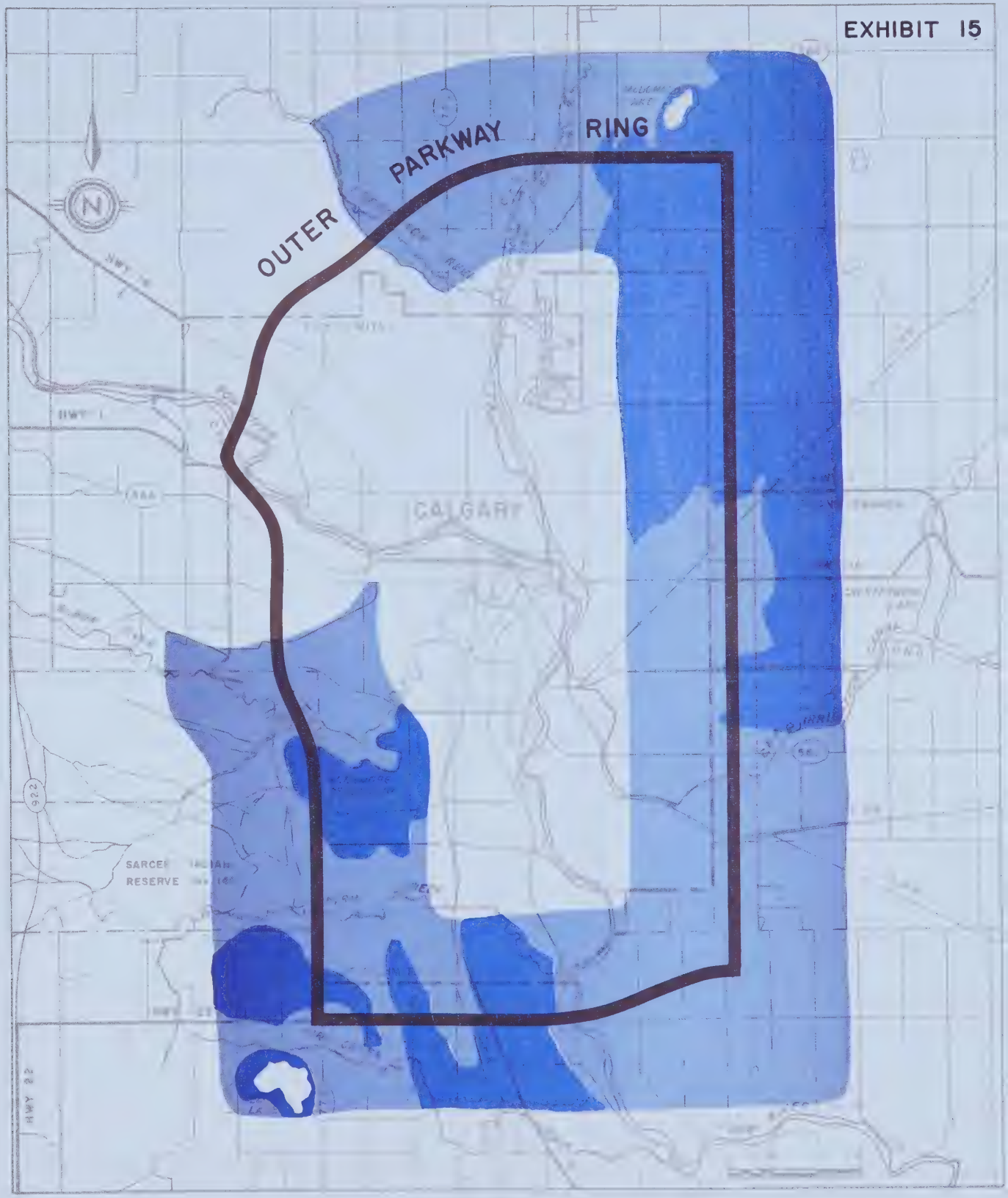
Wildlife Capability

Exhibit 15 indicates the available data regarding wildlife capability. Only waterfowl capability in part of the Calgary Region has been assessed by the Canada Land Inventory. The report on Natural Area in the City indicates that many mammals are present in the remaining habitat.

Conclusion

The land around Calgary is generally quite productive for waterfowl and a highway will be a disruption. Most waterfowl, however, will continue to nest relatively close to highways if there is little pedestrian traffic to disturb them. As long as the road avoids the natural areas, there should be little impact on the ungulates.

EXHIBIT 15



SIGNIFICANT WATERFOWL AREAS

INSIGNIFICANT WATERFOWL AREAS

WATERFOWL LAND CAPABILITY

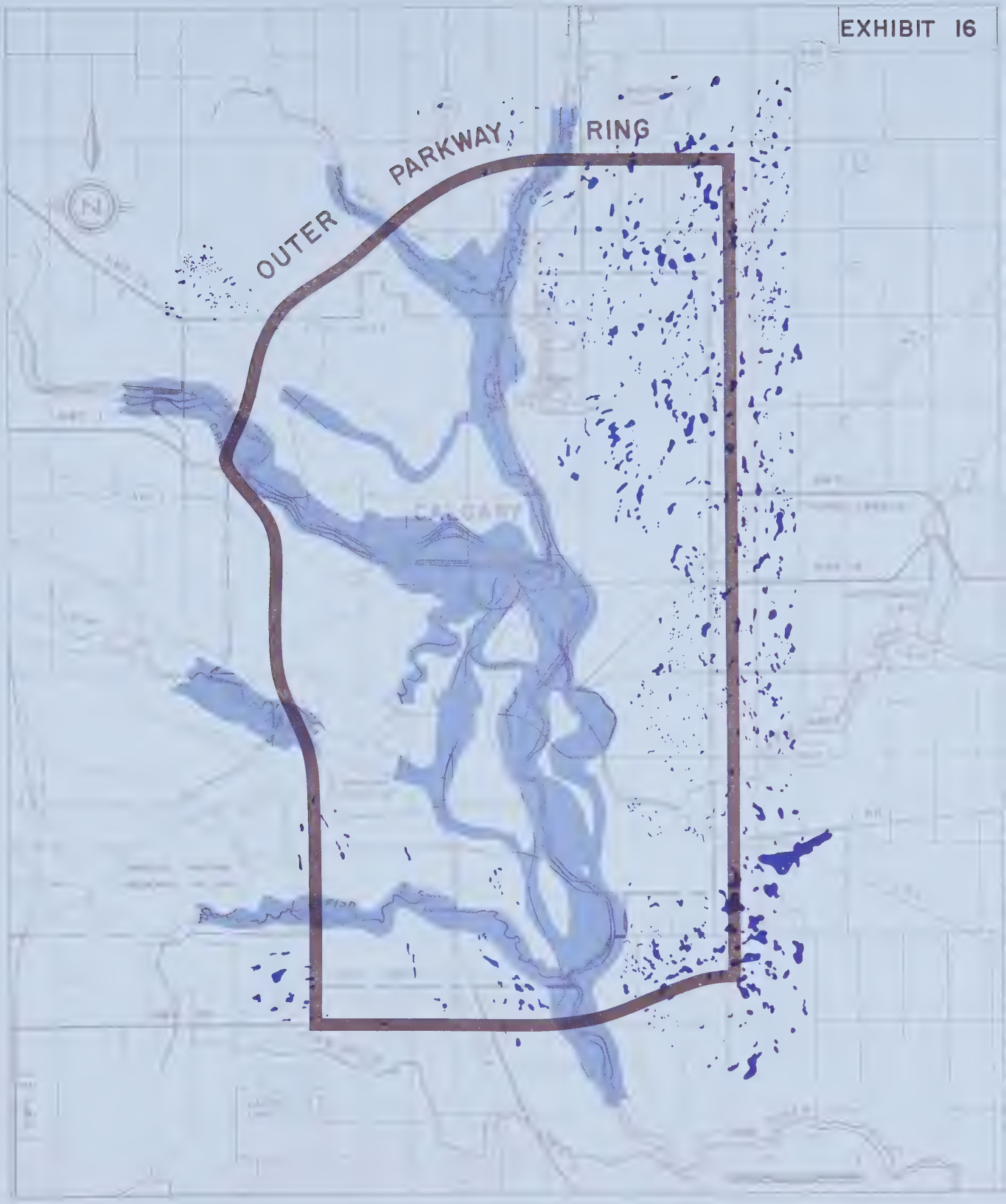
Surficial Aquifers and Sloughs

Exhibit 16 shows the major aquifers and sloughs in the Calgary area. There are three major geomorphological areas in the Calgary region; a flat moraine of silty clay materials on the east and south, a sandy and silty moraine on the west and north, and outwash gravels in the river valleys. The aquifers in Exhibit 16 are in the gravel deposits of the former and present outwash channels. The sloughs are depressions in the impermeable silty clay materials. The water table in Calgary is at 3400 to 3500 feet above sea level. Thus, it is at a depth of 100 to 500 feet in the upland areas and near the surface in the river valleys.

Conclusion

The road will have very little impact on the groundwater resources of the Calgary area; the major water-bearing materials are in the river valleys but no impact is anticipated. Several sloughs will be affected in the east.

EXHIBIT 16



SLOUGHS

SURFICIAL AQUIFERS

SURFICIAL AQUIFERS AND SLOUGHS

Surface Water

The water courses and drainage areas are shown in Exhibit 17. The following biological conditions of the rivers and creeks are a factor to consider in locating the Ring Road:

Bow River - reputedly one of the finest rainbow trout rivers in North America; cold and glacier fed; the trout populations are reduced in the Calgary reach by pollution.

Elbow River - has a denuded watershed resulting in only moderately good water quality; some dolly varden and pike; a very wide flood plain with unstable banks; Glenmore Reservoir, which is fed by the Elbow River, is the water supply for the City of Calgary.

Fish Creek - some spawning runs of rainbow trout; well vegetated valley with stable banks.

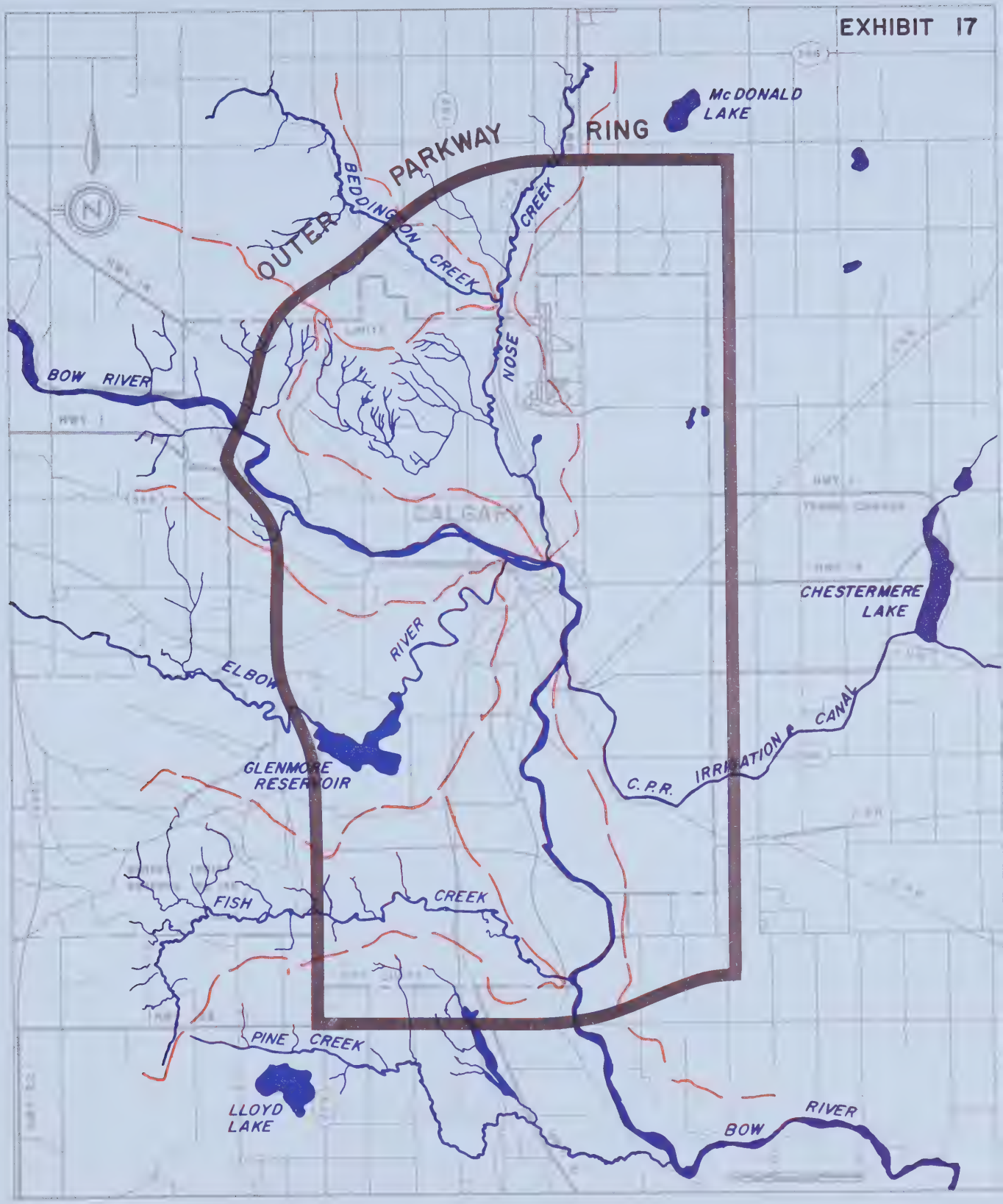
Nose and Beddington Creeks - once fine trout streams but presently have no populations; some plans for habitat rehabilitation.

Conclusion

There could be a moderate impact on surface water and fish populations unless proper precautions are taken. Specifically:

- any construction on the Bow River should be timed to avoid the spawning period (April, May) for rainbow trout and care must be taken to prevent erosion and/or sedimentation;
- care must be taken not to increase the silt loadings in the Glenmore Reservoir;
- consideration needs to be given in design and construction to prevent loss of aquatic habitat in the Elbow River, Fish, Nose and Beddington Creeks.

EXHIBIT 17



WATER COURSES AND DRAINAGE BASINS

Visual Analysis

The ability of the landscape adjacent to the Ring Road to visually absorb the highway is presented in Exhibit 18. There are four classes of absorption shown in this Exhibit ranging from exposed to concealed.

The exposed locations occur at the crossings of the river valleys and on Cairn and Nose Hills. The few highly absorptive landscapes are small ravines. The rest of the area is relatively flat, particularly the east side, and has a moderate ability to conceal the road.

In terms of the view of the road, there are three key locations where the road would visually conflict with the adjacent land uses. These are the crossing of the Elbow River at Glenmore Park, the crossing of the Bow Valley through Bowness and the area between Bowness and the top of Nose Hill. On the other sections of the road, existing and proposed urban development will be adjacent to the right-of-way. In these locations, the topography is flat and the road could easily be screened.

In terms of the view from the road, the west, north and south segments provide an interesting sequence of vistas and views. The view from the eastern segment will be quite limited since the roadway alignment would be a straight line through a flat landscape.

Conclusion

Visually, the road will have an impact on the environment of Glenmore Park. In this location, little can be done to reduce this impact. Two other sensitive areas are Bowness and Nose Hill. Here, with good design of the road and planning of adjacent land uses, any visual impact will be reduced to minimal levels.

EXHIBIT 18

VERY LOW (exposed)
LOW
MODERATE
HIGH (enclosed)

LANDSCAPE ABSORPTION

Soils - Agricultural Capability

Exhibit 19 indicates the agricultural capability of soils in the proposed Corridor, and Table 1 gives the percent of capability categories covered by the proposed Ring Road route. A considerable proportion of the route is valuable agricultural land. The road would thus remove about 5700 acres of land and perhaps more if a wider Corridor is required.

Table 1. Soil capability on proposed Corridor

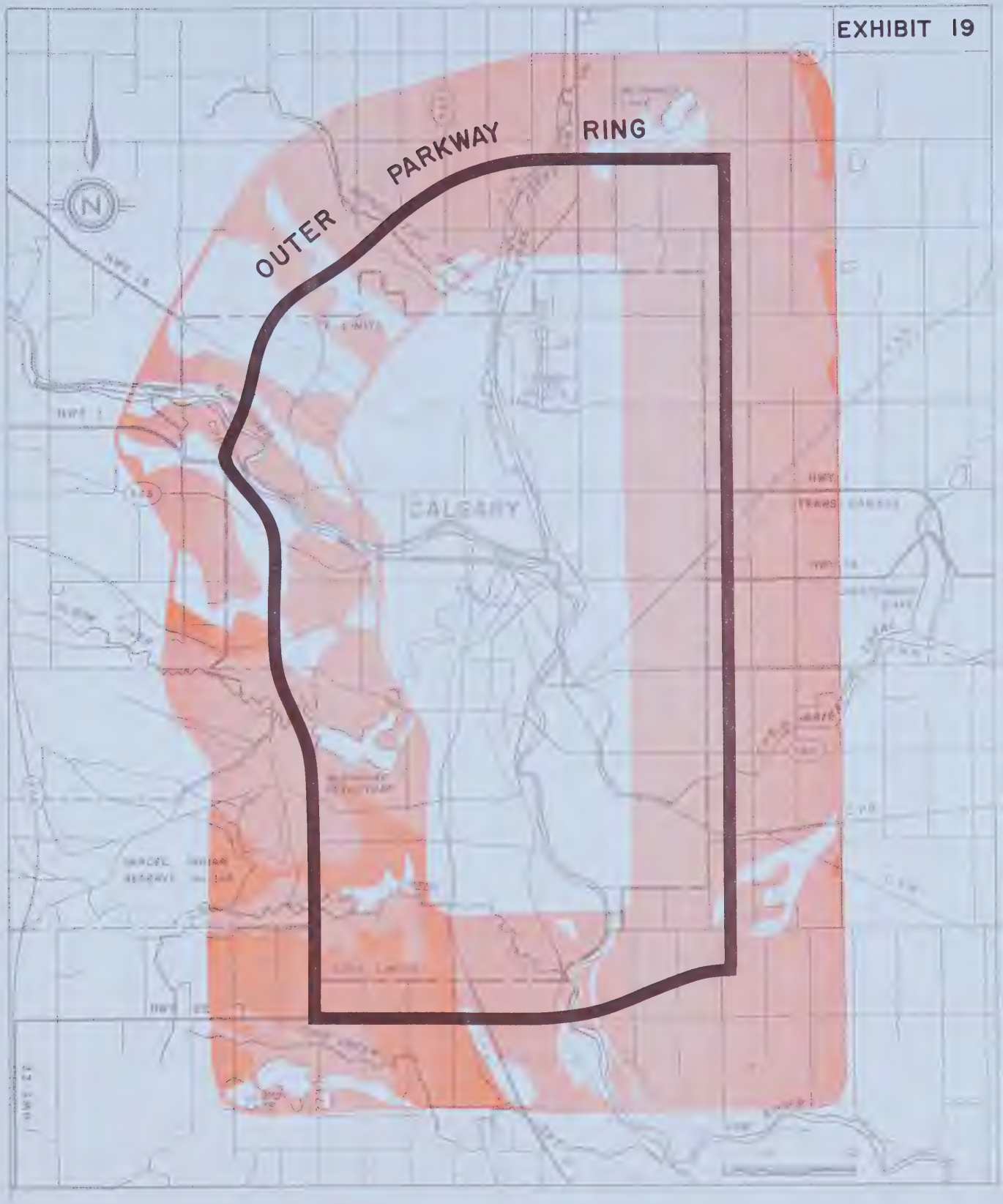
Capability	%	Acres
1. Poor-fair pasture	0	0
2. Fair-good pasture	16	910
3. Good-excellent pasture	0	0
4. Poor-fair arable	6	340
5. Fair-fairly good arable	20	1140
6. Fairly good-good arable	50	2850
7. Good-very good arable	8	460
8. Very good-excellent arable	0	0
	100.0	5700

Conclusion

The soils capability is based on the Soil Survey Ratings. If the Canada Land Inventory Ratings were used, there would be less good agricultural land used, as these ratings exclude the No. 2 soils on the South Leg, due to adverse topography through the area.

With about 75% of the soils in the area of the Ring Road of good agricultural capability, it is unavoidable that agriculturally suitable soils will be covered by the road. However, these soils are adjacent to the City, and it is likely that they already are or soon will be removed from agricultural production.

EXHIBIT 19



AGRICULTURAL SOILS CAPABILITY

Recreation Areas and Capabilites

Existing and proposed recreation areas and Canada Land Inventory recreation capabilities (Classes 1 to 4) are shown in Exhibit 20. It is apparent in this exhibit that the best recreation lands in the City of Calgary are in the river valleys. Comments on the impacts of the Ring Road in these locations are as follows.

Glenmore Park - At present, this is the largest park in the City of Calgary. It consists of the Glenmore reservoir and surrounding lands which contain a variety of recreational facilities ranging from a yacht club and pioneer village to a natural/interpretive area. The Ring Road would cross the Elbow River Valley west of the developed Park and would have a serious impact on the natural area.

Fish Creek Valley - The Fish Creek Valley is proposed as a recreation area. The crossing of this Valley would occur close to the existing road alignment at the boundary of the Sarcee Indian Reserve. Thus, only a minimal impact is anticipated.

Bow River Valley - No significant impact.

Nose and Beddington Creeks - No significant impact.

Nose Hill - The road will be outside or abutting this proposed recreation area, depending on the final decision on the Park. Thus, the road will have no impact on the Park and will, in fact, improve access to it.

Bowness Flats Area - The Bowness Flats have been proposed as a recreation area. The Ring Road would bisect the proposed park and, therefore, could have a serious impact if consideration is not given to the adjacent land use during design and construction.

Conclusion

In the Glenmore Park area, the road would not remove much recreation space or interfere with recreation activities. It would affect the nature reserve. This impact is discussed in the section on natural areas. In the Bowness Flats, there is a possible conflict with a proposed recreation area. This impact could be avoided with good planning.

EXHIBIT 20

RECREATION AREAS AND CAPABILITIES

Recreational Use of the Ring Road Corridor

A wide right-of-way corridor for the Ring Road in Calgary could have some recreational benefits. As can be seen in the Exhibit on existing and proposed recreation areas, there is very even and generous distribution of facilities in the presently developed area of the City. Along the western segments of the road, the right-of-way could be used to provide space for bicycle and foot paths joining Nose Hill, Bowness, Glenmore Park and Fish Creek. These trails would fit very well with the other opportunities for trails within the City. In addition, recreation nodes could be created at Nose Creek, Fish Creek and the southern crossing of the Bow River as in Exhibit 21.

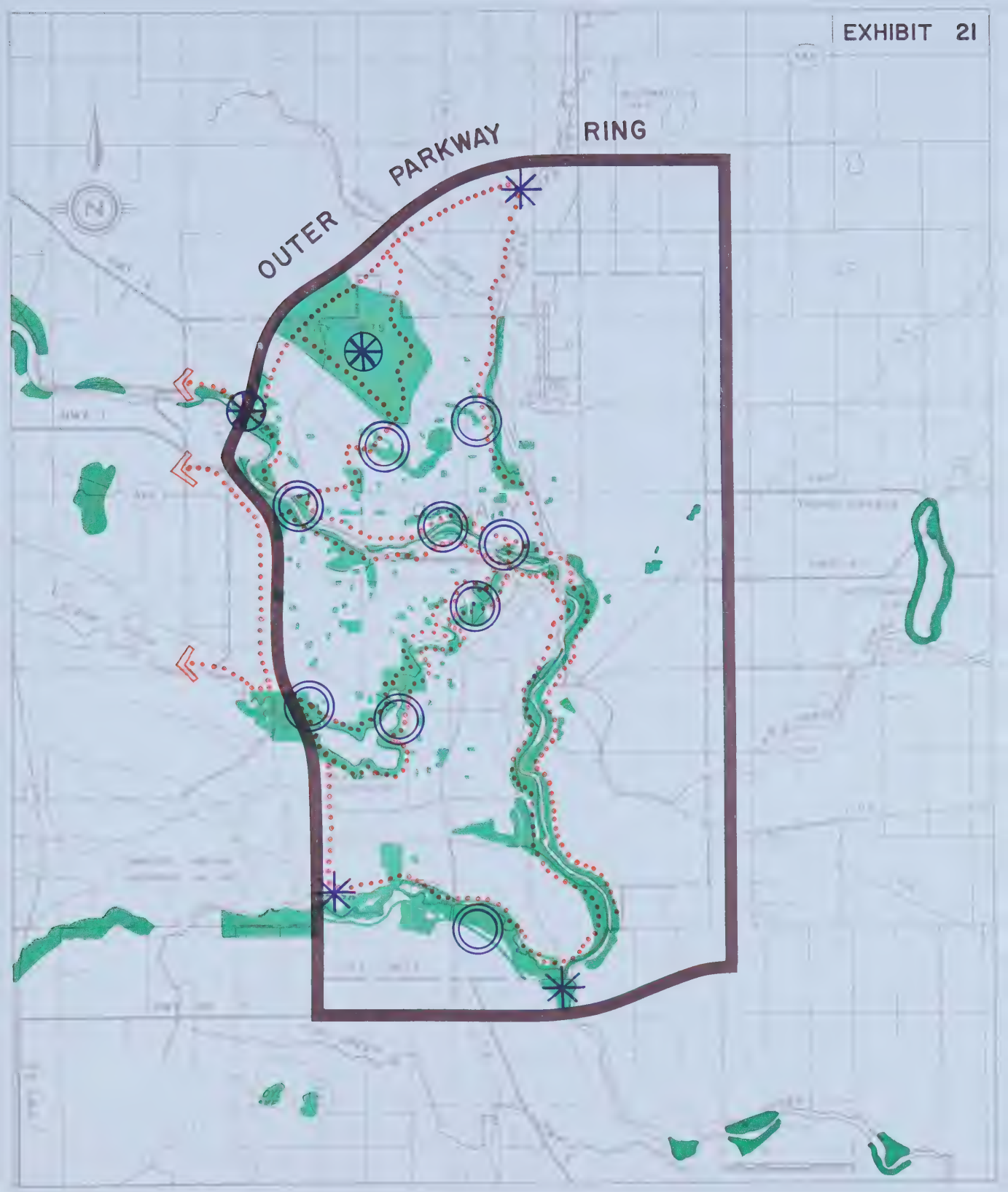
In the east, a different situation exists. As the City expands in this direction, very few opportunities exist for major recreation areas. Thus, a wide right-of-way could be very important in this area, to provide needed recreational space.

Conclusion

As Calgary grows, there will be an increasing demand for recreation space. The Ring Road could provide for some of this demand by:

- development of major facilities in the right-of-way, particularly in the east and at crossings of the river valleys;
- allowing for bicycle trails and foot paths;
- improving access to areas such as Nose Hill.

EXHIBIT 21



EXISTING & PROPOSED RECREATIONS AREAS

BICYCLE TRAILS & FOOT PATHS

PROPOSED RECREATION NODES ON CORRIDOR

EXISTING
PROPOSED
} COMMUNITY & RECREATION CENTRES

RECREATION POTENTIAL OF THE RING CORRIDOR

Archeological Sites and Significant Natural Areas

There are many known archeological sites in the Calgary region. These range in importance from the finding of a tooth or arrowhead to the discovery of "teepee rings". Exhibit 22 indicates these sites and their priorities. Most of the sites are located on the outwash terraces in the river valleys.

Several of the sites in Glenmore and Nose Creek areas are within the Ring Road corridor. Prior to construction, time should be allowed for careful investigation and recovery of any archeological features. In this way, there will be no impact on the sites.

The Calgary Field Naturalists have identified the following as being the most important natural areas in Calgary:

- Edworthy Area - coniferous woods, riverine forest, fescue prairie
- Fish Creek - riverine forest, Aspen Parkland, foothills vegetation;
- Glenmore Park - rich and diverse flora and fauna;
- Nose Hill - uncultivated prairie;
- Pearce Estate - riverine forest;
- Inglewood Bird Sanctuary.

These areas are shown on Exhibit 22.
The Ring Road could significantly damage the vegetation and environment of the designated natural area west of the Glenmore Reservoir, even with careful design and construction of the facility.

Conclusion

During the final route selection stages important archeological sites should be avoided. Prior to construction of the road, adequate time should be allowed for careful investigation and recovery of any archeological features. The nature reserve at Glenmore Park is a significant public asset. Whether the road is built on fill or a structure in this location, there will be disturbance of the ecological resource.

EXHIBIT 22

- FIRST & SECOND PRIORITY
- THIRD PRIORITY
- OTHER KNOWN SITES (no priority assigned)
- SIGNIFICANT NATURAL AREAS

ARCHEOLOGICAL SITES & SIGNIFICANT NATURAL AREAS

Air Pollution

Air pollution is coming to be regarded as a serious public health problem and many reports have linked pollution concentration with illness and death rates. Pollution also results in visibility problems. Smog, and in the cold Alberta climate, ice fogs, can reduce visibility on highways and airports.

Conclusion

Specific meteorologic data are required to estimate the concentration of pollutants in a city air mass. These data are not yet available and thus it is not possible to identify a relationship between numbers of motor vehicles and pollution concentration in Calgary. It is safe to suggest, however, that a continued dependence upon motor vehicles in the City will result in worsening air conditions. If a Ring Road encourages this dependence and decreases the role of rapid transit, rail roads, and other less polluting forms of transportation, it will contribute to a serious problem. If a Ring Road reduces inner city vehicle density and enhances the use of other means of transportation, it will help reduce air pollution.

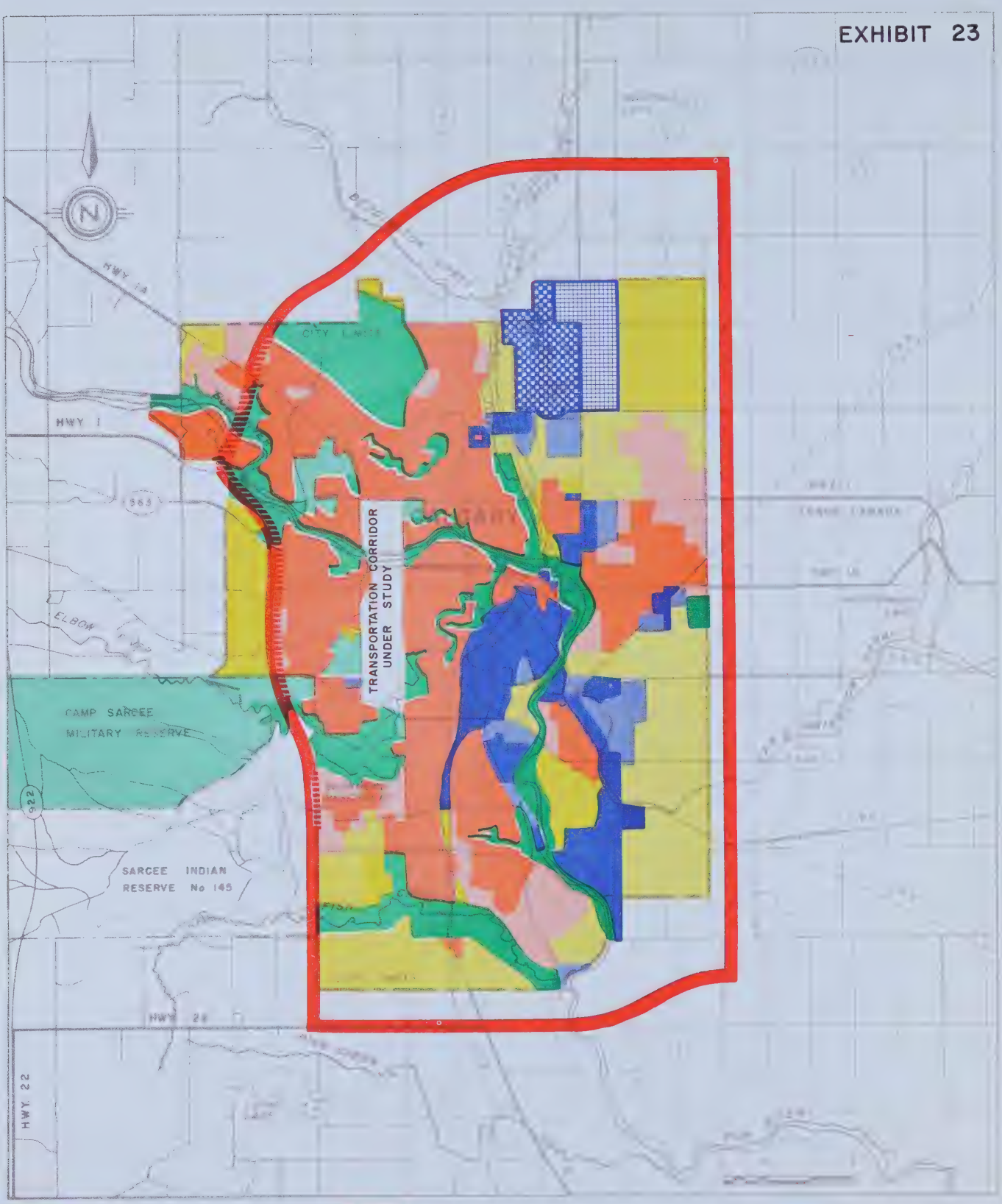
Noise Pollution

Noise generated by vehicular traffic can be a serious problem in urban areas. The land most sensitive to noise pollution is a quiet neighborhood. Generally noise levels which are acceptable in residential areas range from 50 dBA to 65 dBA, and higher in commercial and industrial areas. The difference between 70dBA, which is acceptable in an industrial area, and 50 dBA is substanial - 70 dBA being four times as loud as 50 dBA. A current model of truck travelling at highway speeds emits a noise level of about 92 dBA at the roadway. Indications from reserach in this field are that these levels will be reduced in the near future by improvements in muffler systems.

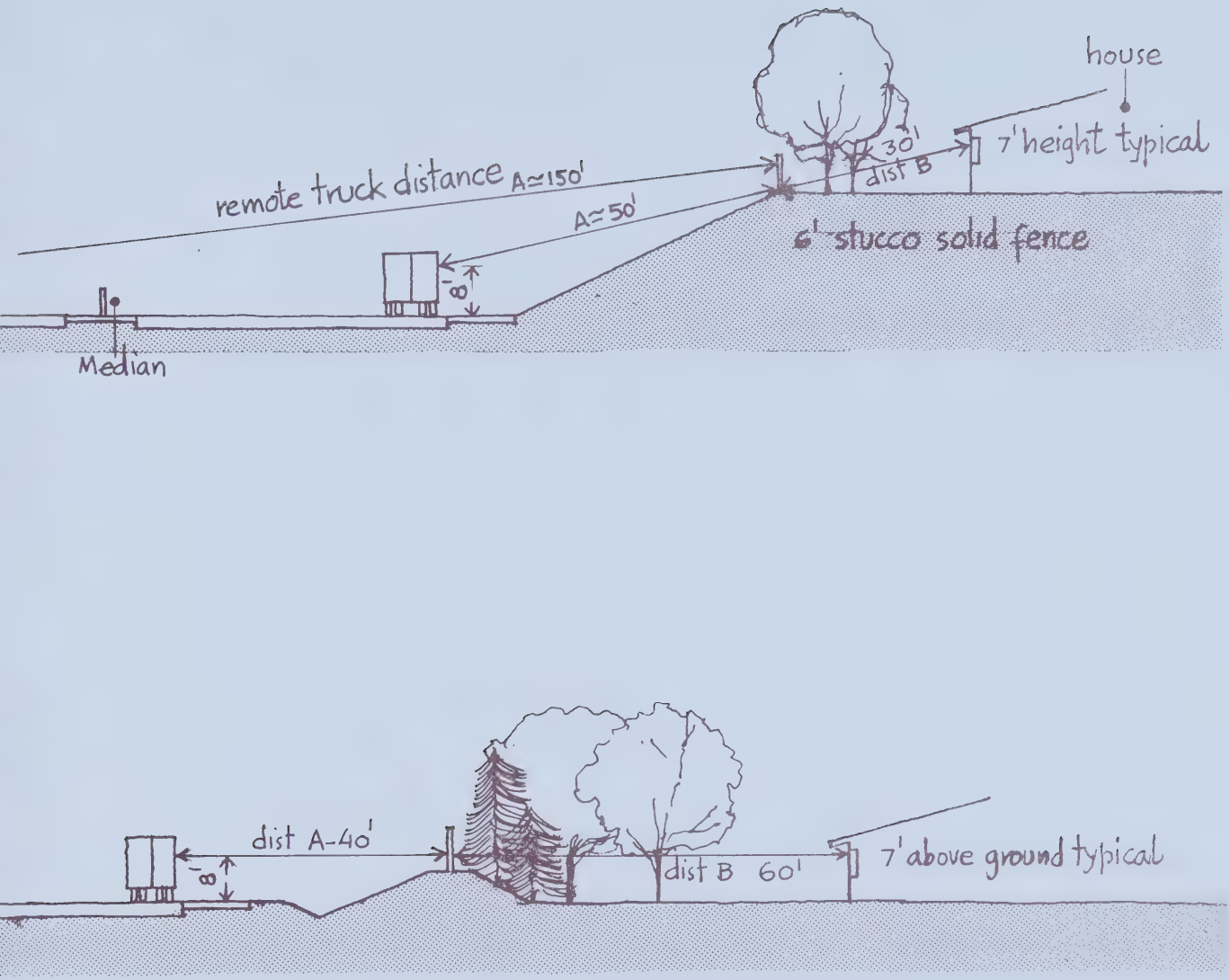
The noise generated by traffic on the Ring Road could create noise pollution problems along several segments of the road. These sensitive areas are shown in Exhibit 23. The most critical locations are the Sarcee Trail from Glenmore Park to the Bow Trail, and the section through Bowness. Here, residential development already abuts the alignment and adequate buffering would require considerable expense. South of Glenmore Park and north of Bowness, residential development is planned adjacent to the right-of-way. However, there is adequate time and space to buffer these segments.

The Calgary noise by-law provides guidance in controlling noise at its source. In order to meet criteria for ambient noise levels in sensitive areas (i.e. residential neighborhoods adjoining the road), special design of the right-of-way will be required. Two examples of such designs are illustrated in Exhibit 24. In these cases, depressing the road or the construction of earth berms, or a combination of both, along with suitable vegetative treatment, provide an effective barrier to noise and conceal the visual impact of the traffic.

EXHIBIT 23



NOISE POLLUTION



scale
0' 10'

TYPICAL BUFFER TREATMENT

Conclusion

Noise could have a significant impact if the right-of-way is not properly buffered. Exhibit 24 shows how the excessive noise levels could be reduced through treatment of the right-of-way.

Susceptibility to Snowdrifting

Drifting snow is a serious safety consideration, particularly in "open areas" where the facility is not sheltered by existing vegetation. Drifting snow is always deposited at places where obstacles interfere with the normal passage of the wind.

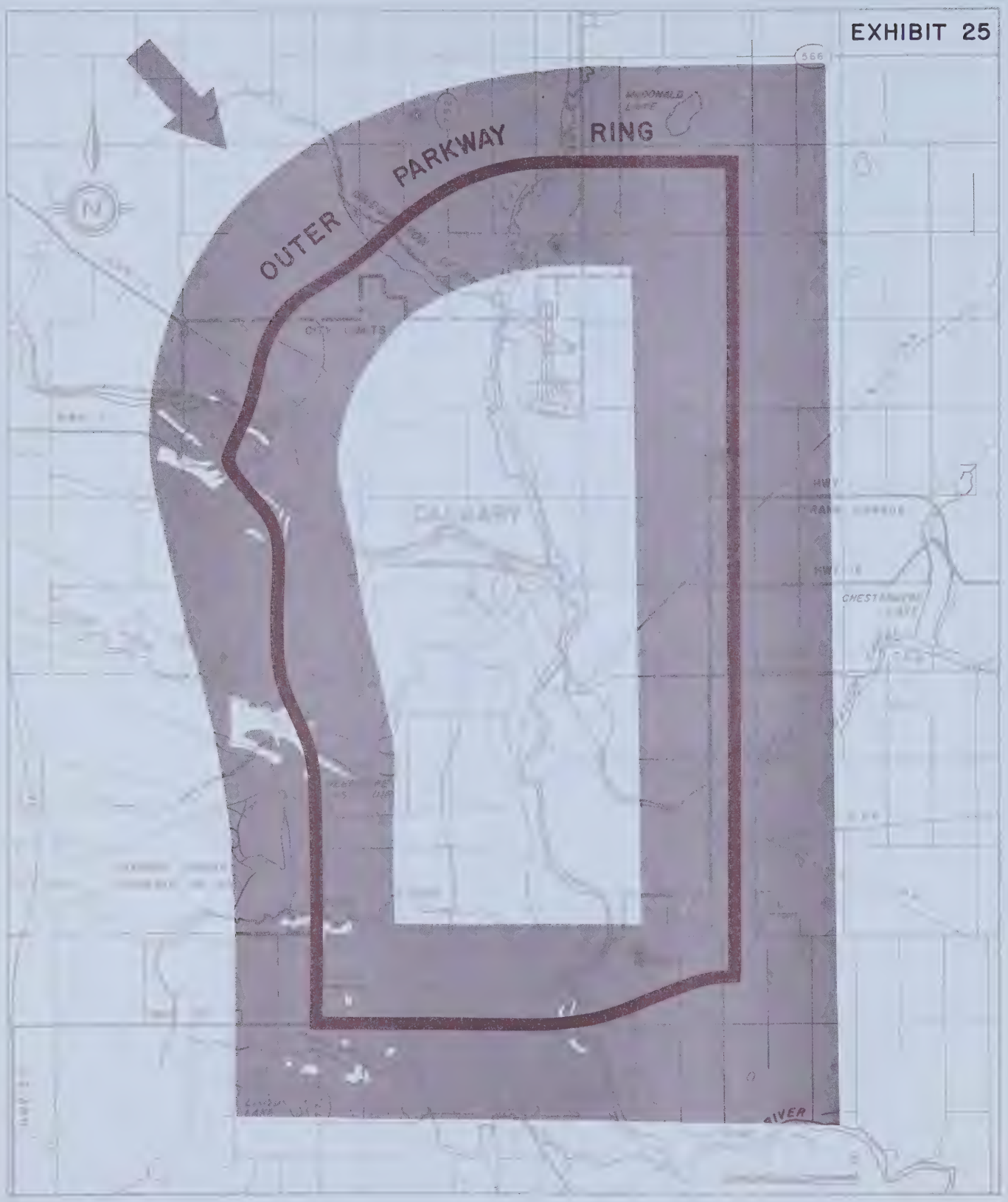
Various conditions exist depending on the height of embankments:

- There is no deposit on low embankments rising just above the surrounding snow cover. (Exhibit 26A)
- On high embankments with steep slopes a "vortex" form occurs on top and leads to the formation of mounds. (Exhibit 26B)
- Similar conditions are present on cuts in the side of hills. (Exhibit 26C)
- Cuts more than 20' deep are not subject to drifting if there is sufficient room on the sides to accommodate the deposited masses of snow. (Exhibit 26D)

Natural snowdrift deposits on slopes 8:1 on the windward and 6:1 on the lee side, and therefore deposits do not occur on side-slopes of cuts where the steepness does not exceed these values. This is, of course, the most expensive way of protecting cuts due to the extensive grading quantities and increased right-of-way requirements.

Exhibit 25 indicates that the proposed corridor is located predominantly along wide-open unsheltered agricultural land, and is susceptible to snowdrifting. This problem would have to be given special consideration in the follow-up stages.

EXHIBIT 25



NO PROTECTION - OPEN LAND

GOOD PROTECTION – WOODLAND

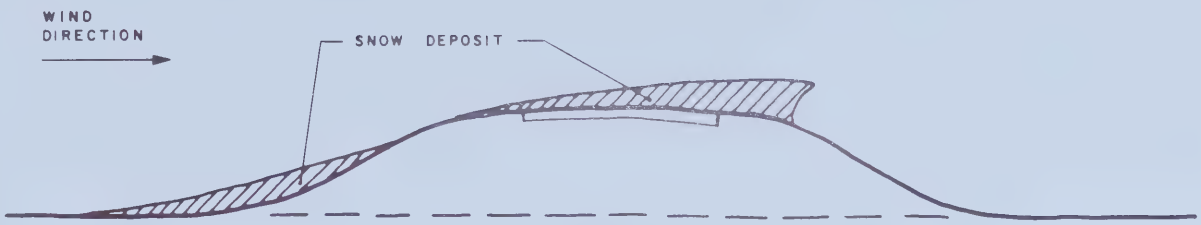
WIND DIRECTION

SUSCEPTIBILITY TO SNOW DRIFTING

EXHIBIT 26

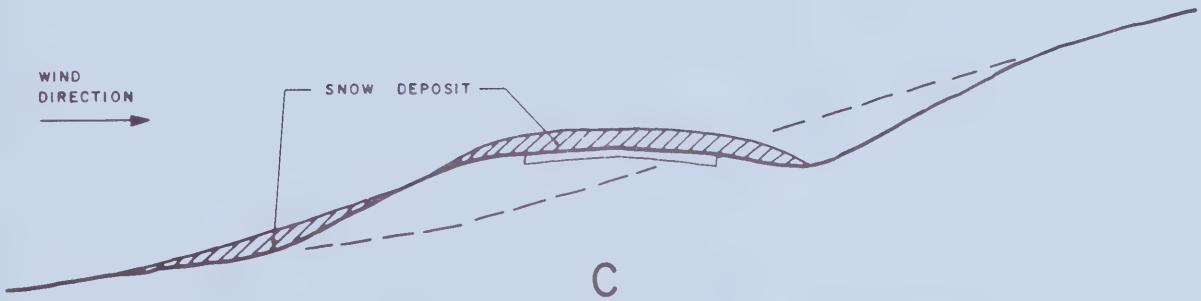
A

SNOWDRIFTS ON LOW EMBANKMENTS
UNDER 6 FOOT



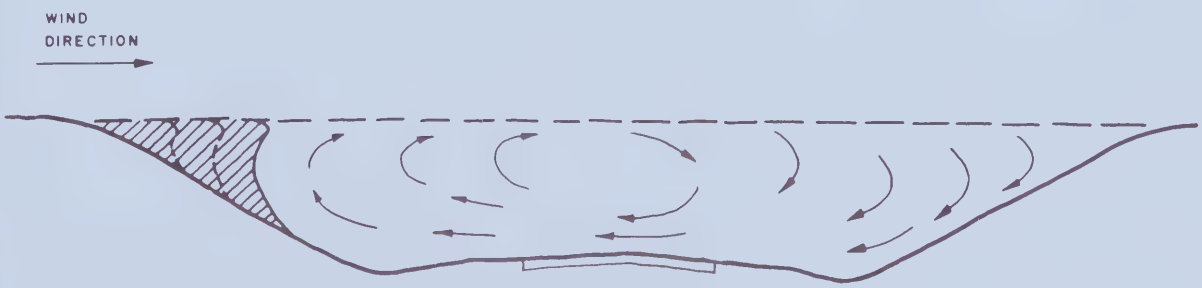
B

SNOWDRIFTS ON HIGH EMBANKMENTS
OVER 6 FOOT



C

SNOWDRIFTS ON HILLSIDE CUTS



D

SNOW DEPOSITS IN DEEP CUTS
OVER 20 FOOT

SNOWDRIFTING

EMBANKMENT CONDITIONS

Conclusion

The impact is substantial. However, there is little that can be done to reduce this impact in terms of location alternatives. Therefore, the solution to this problem will be limited to appropriate design treatments, as suggested earlier, and/or pre-planting of vegetation within the "environmental buffer zone".

Staging Considerations

The Ring Road is intended to be developed to an ultimate 4-lane facility with flexibility incorporated within the width of the median for the widening of an additional 2 lanes if and when required. One possibility in terms of staging of the 4-lane facility with its interchanges, grade separations, etc., would be to initially build a 2-lane facility with at-grade intersections. This would be a conventional approach if the ultimate facility would be at-grade or somewhat close to it.

If, however, lack of width required for an "environmental noise buffer zone" necessitates sections of the Ring Road to be depressed, then staging in this context will be much more difficult. There is a possibility that at these isolated locations the ultimate section will have to be built at the outset, including portions of interchanges, grade separations, etc. Staging of the total facility should be investigated in more detail in the following stages.

Conclusion

Staging of construction for the Ring Road would be relatively simple if it was at-grade. Staging would be hampered if segments of the facility were required to be below grade.

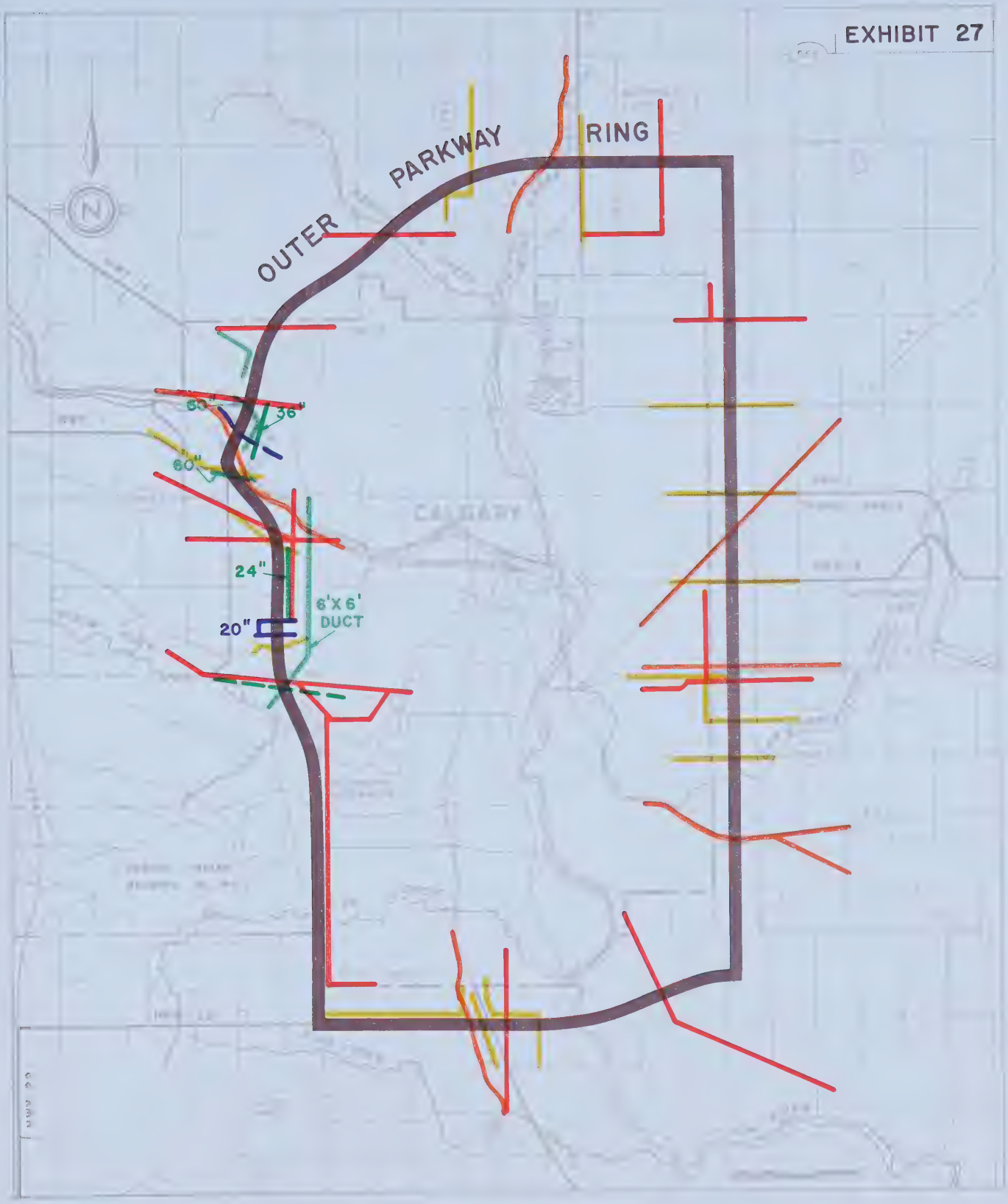
Utilities

Exhibits 27 and 28 indicate the major utilities and oil and gas pipelines within the study area. In general there are no major construction difficulties anticipated with regard to utility crossings. Detailed study would be required during the follow-up stages to accurately ascertain the extent of utility relocation requirements.

Conclusion

The impact on utilities within the corridor will not be great. A shift in the corridor location will not have a significant bearing on the extent of utility crossing .

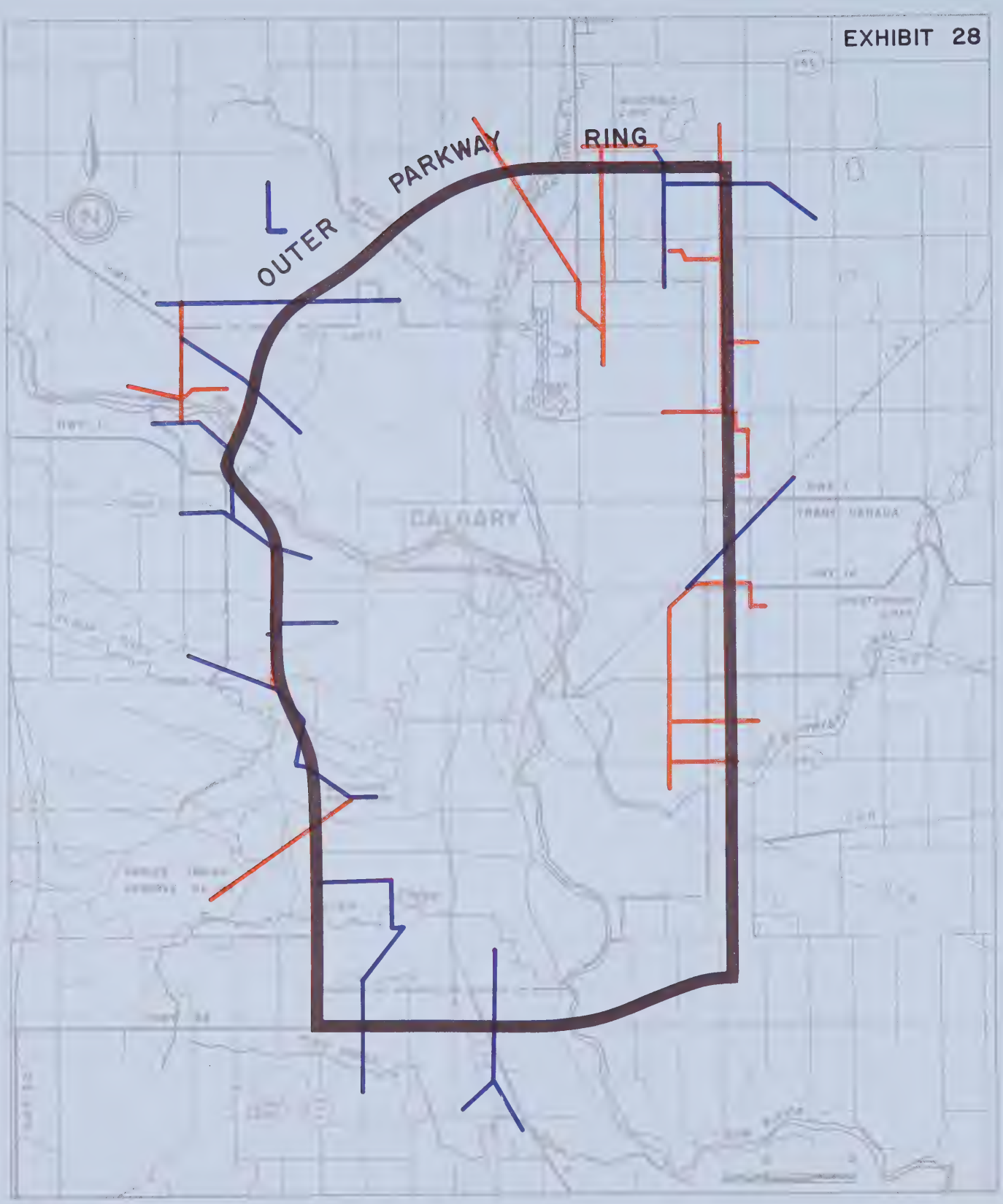
EXHIBIT 27



STORM SEWER
EXISTING WATER
PROPOSED WATER
RAILWAYS
POWER LINES
EXISTING SANITARY
PROPOSED SANITARY
AGT LINES

UTILITIES

EXHIBIT 28



GAS PIPE LINES

OIL PIPE LINES

GAS AND OIL PIPE LINES

Cost

Separate cost estimates are given for Stage I and the Ultimate Stage with a breakdown of land costs and construction costs. The initial expenditure would be for acquistion of right-of-way. This would be followed by construction of sections of a two-lane at-grade facility.

A 350' right-of-way has been assumed for Stage I. Although the total 350' would not be required initially, land costs have been based on this because it is a minimum requirement for the ultimate stage. Costs for right-of-way for buffer zones and/or multiple use purposes would be added to the basic land costs. The estimates are based on 1973 costs from the Department of Highways and Transport.

STAGE I: (Two Lane Two Way At-grade)

Road Construction:	$ 13,200,000
Bridges:	
3 Creek Crossings @ 500,000/Structure	1,500,000
2 River Crossings @ 2,000,000/Structure	4,000,000
1 River Crossing @ 3,000,000/Structure	3,000,000
Total Construction Cost	$ 21,700,000

Land Costs:

Alternate A - 2200 Acres (350' R.O.W. width without interchanges)	$ 9,700,000
Alternate B - 5700 Acres (350' R.O.W. width with interchanges)	24,400,000
Total cost with Alternate A	$ 31,400,000
Total cost with Alternate B	$ 46,100,000

ULTIMATE STAGE: (Four Lane Divided)

Road Construction:		$ 26,400,000
Interchanges:		
Minor:	26 @ 1,200,000/Interchange	31,200,000
Intermediate:	14 @ 2,000,000/Interchange	28,000,000
Major:	4 @ 3,500,000/Interchange	14,000,000
	2 @ 5,000,000/Interchange	10,000,000
Bridges:		
3 Creek Crossings	@ 1,000,000/Structure	3,000,000
2 River Crossings	@ 3,000,000/Structure	6,000,000
1 River Crossing	@ 5,000,000/Structure	5,000,000
Grade Separations: (Railway)		
	7 @ 750,000/Structure	5,250,000
	Sub Total	$128,850,000
Landscaping	(10% Sub Total)	12,800,000
Utilities	(5% Sub Total)	6,400,000
	Total Construction Cost	$148,050,000
Land Costs:		
Alternate A - 5700 Acres (350' R.O.W. width with interchanges)		24,400,000
Alternate B - Additional land to provide 1000' right-of-way (500' each side of center line)		15,900,000
	Total Cost with Alternate A	$172,450,000
	Total Cost with Alternate B	$188,350,000

SOCIO-ECONOMIC ANALYSIS

SOCIO-ECONOMIC ANALYSIS

Introduction

The purpose of this study was to investigate the feasibility and desirability - from a social and economic point of view - of proceeding with the development of the planned Outer Ring Road around the City of Calgary.

Specifically, the study addressed such questions as the following:

1. What are the perceived purposes of the proposed Ring Road? Are these purposes appropriate? Are they likely to be achieved? With what kinds of unanticipated consequences?
2. What costs, social and economic, direct and indirect, are likely to be involved in the Ring Road itself and in its linkage systems?
3. What kind of benefits may be anticipated - in terms of the social, industrial, commercial, residential and cultural development of the City?
4. In light of such considerations of social and economic costs and benefits, what priority does the Ring Road deserve? How does it rate with other competitors in the process of urban development?
5. Is the proposed location of the road socially and economically ideal?

The study attempted to provide systematic, though certainly not exhaustive, responses to these questions.

In an attempt to relate our methods to the processes of policy and decision-making, we adopted the following sequential steps in our analysis:

(a) a clarification of objectives as perceived by the two involved authorities - the Province and the City;

(b) an analysis of interrelationships between the Ring Road and certain critical social and economic variables, with particular reference to other elements in the transportation system;

(c) an analysis of benefits and costs; and

(d) considerations of special problems.

It should be noted that the benefit-cost analysis included only a limited number of quantifiable units, because available cost figures were rather gross approximations and because most potential benefits could not be expressed in dollar terms.

The Objectives of the Ring Road

The first step in the analysis of any public program is to clarify the objectives of that program. For lacking a clear view of objectives, one cannot proceed to make proper comparisons between the desired outcomes and the likely outcomes.

So, as a preliminary activity, discussions were held with representatives from the Provincial Department of Highways and Transport and from the City of Calgary, to determine the objectives of the Ring Road from their respective points of view.

1. The Provincial Government Perspective

From the viewpoint of the Provincial Government, three important objectives seem operative:

1. To expedite the flows of city traffic, from points adjacent to or near the Ring Road to other points adjacent to or near the Ring Road. (For example: persons who live near and work near the Ring Road) The potential for the realization of this goal can be assessed in terms of the likely forms of development and, hence, likely levels of traffic in and out of the proposed road itself.

2. To reduce future costs by anticipating and providing for future needs. This aim rests on the assumption that, eventually, a road system is likely to be needed in the vicinity of the Ring Road, and that to provide now for such needs should be to minimize costs and aid development, since land acquisition before development is more economical than after and since proactive development planning is to be preferred over reactive.

3. To provide a bypass for non-urban traffic. This aim relates to the diversion of flows of traffic on regional highway systems as these might impact urban traffic problems.

2. The City of Calgary Perspective

From the point of view of the City of Calgary, the Ring Road should serve the above objectives, and more:

1. To expedite flows of city traffic. (as in #1 above)
2. To provide a bypass for non-urban traffic. (as in #3 above)
3. To reserve a "corridor" around the City. The expressed purpose here is (as in #2 above) to anticipate future growth and minimize costs by preplanning.
4. To enhance the recreational potential of the "Outer City".
5. To influence the development of desired urban forms.

It should be noted that Calgary planners and administrators are aware of the spin-offs that a Ring Road would have on the City's recreational complex, corridor use, etc. But they feel that any analysis of the Ring Road's feasibility will necessarily be incomplete until the urban evaluation system currently being developed for the City is completed. The urban evaluation system is essentially a simulation model of activities in the City and the way in which these activities, e.g., transportation systems, utility systems, etc., affect and are affected by changes in programs such as rapid transit systems, ring road systems, freeways, utility corridors, regional park plans, etc.

All of these objectives and perceived benefits of the proposed Ring Road seem desirable and reasonable enough. But the questions are:

1. Will these objectives, in fact, be realized? Will the Ring Road produce the benefits expected of it?
2. If so, at what social and economic costs?

Socio-Economic Variables Related to Ring Road Development

1. Population

Since 1966, Calgary has been the most rapidly growing city in Canada.

Table 1 demonstrates the magnitude of population growth in Calgary from 1946, when the metropolitan area boasted a population of about 107,000, to January 1, 1973, when the population is estimated to have reached a level of about 425,000. Since 1946 the City of Calgary and the census definition of the Calgary Metropolitan Area have been the same. While the rate of population growth was typically six or seven percent in the 1940's and 1950's, that rate had declined to three to four percent by the 1960's and 1970's. Even so, the typical level of growth in these latter years was in the 10,000 to 18,000 range.

When the Alberta Oil and Gas Conservation Board prepared its population projections by census districts in 1970, it found a Calgary census district population of nearly 370,000 in 1966. The Board found that Calgary's 2.7 percent growth rate was the highest in Alberta, and though it projected a declining birth rate in the City until 1981, it estimated a census district population of more than 563,000 people by 1980. Moreover, the Calgary census district was estimated to reach a population of nearly 735,000 by 1990; nearly 900,000 by 1999; and more than one million by 2005 - Alberta's Centennial Year. (FN D.A. Seastone, Economic and Demographic Futures in Education: Alberta, 1970-2005. Human Resources Research Council and Commission on Educational Planning, Edmonton, 1971)

In 1970, the Calgary City Planning Department projected population in Metropolitan Calgary to 1991. These projections are shown in Table 2. Thus far, the medium fertility, medium migration estimate has held true. For example, in June, 1972 the projected model used by the City of Calgary

TABLE 1

POPULATION OF THE CITY OF CALGARY AND METROPOLITAN CALGARY
JANUARY 1 AND JUNE 1, 1946 - 1973

Year	City of Calgary		Metropolitan Calgary[a]		Annual Increase[b] %
	January 1	June 1	January 1	June 1	
1946	99,390	100,044	105,850	106,700	3.1
1947	101,260	102,330	108,490	109,970	4.4
1948	104,090	106,100	112,380	114,850	7.0
1949	109,980	112,850	119,490	122,900	7.1
1950	116,980	120,030	127,900	131,580	7.3
1951[c]	125,460	129,060	136,960	141,220	7.9
1952[c]	134,510	138,410	147,640	152,400	8.1
1953[c]	144,090	148,290	159,470	164,670	7.7
1954[c]	154,580	158,540	172,330	177,410	6.4
1955	166,900	171,100	183,900	188,770	6.5
1956[c]	177,450	181,780	196,040	201,022	5.7
1957	190,920	195,430	206,980	212,460	7.6
1958	203,410	208,850	222,030	228,580	7.2
1959	215,900	221,690	237,790	244,950	7.2
1960	230,850	236,280	255,940	262,690	6.2
1961[c]	240,260	249,641	268,100	279,062	1.9
1962	267,650	270,060	281,990	284,400	3.0
1963[c]	274,670	278,590	288,970	292,840	4.2
1964[c]	291,150	296,070	300,300	305,170	3.4
1965[d]	310,720	315,680	310,720	315,680	4.7
1966	322,780	330,575	322,780	330,575	4.1
1967	336,540	344,190	336,540	344,190	4.8
1968	354,856	360,760	354,856	360,760	4.2
1969	369,025	375,860	369,025	375,860	3.9
1970	385,436	390,680	385,436	390,690	3.2
1971	398,034	403,319	398,034	403,319	3.6
1972[c]	412,777	417,780	412,777	417,780	n/a
1973	424,787	n/a	424,787	n/a	n/a

n/a Not available
a 1971 census definition of Metropolitan Calgary
b Based on June 1 population estimates
c Years in which annexations were made to the City
d The boundaries of the City and Metropolitan Calgary became the same August 15, 1964

Sources: 1) Metropolitan Calgary Population: Historical Review 1946 - 1970 (Calgary: City of Calgary Planning Department, January, 1970).
2) Census of Canada, 1971 (June 1)
3) 1972, 1973 Civic Census (January 1)

city of calgary
planning department
march, 1973

Planning Department postulated a population of 416,400 for Metropolitan Calgary. The civic census on June 1, 1972 revealed a population of 417,780. Similarly, on January 1, 1973, the City's population was estimated at 424,787 - still in line with the medium fertility, medium migration assumptions. One suspects that the medium fertility assumption, however, will not hold true in the sense that the decline in fertility rates is projected to end by 1974.

According to this set of projections, city population will reach more than 535,000 by 1980 and more than 705,000 by 1990. If the medium migration assumption continues to be met - about 8,000 net migrants per year - then even with lower fertility assumptions, Calgary's population by 1980 and 1990 would still run to more than 533,000 and 691,000 respectively.

While the rate of population growth in Calgary has declined in the 1960's and 1970's, it still remains the fastest growth rate in Canada. Recent experience suggests that migration will continue to push population levels upward; that the birth rate will continue to fall; and that the City will continue to grow at the smaller rate projected in Table 3, and reflected in the earlier Table 2.

TABLE 2

PROJECTED POPULATION OF METROPOLITAN CALGARY
JUNE 1, 1970-1991

Year	Low Fertility[a]			Medium Fertility[b]			High Fertility[c]		
	6000[d]	8000[d]	10,000[d]	6000[d]	8000[d]	10,000[d]	6000[d]	8000[d]	10,000[d]
1970	387,200	389,200	391,300	387,200	389,200	391,300	387,200	389,200	391,300
1971	398,700	402,700	407,000	398,700	402,700	407,000	398,800	402,800	407,000
1972	410,300	416,400	422,900	410,300	416,400	422,900	410,600	416,700	423,200
1973	422,100	430,300	439,200	422,100	430,300	439,200	422,600	430,900	439,700
1974	434,000	444,500	455,700	434,000	444,500	455,700	434,900	445,400	456,600
1975	446,100	458,800	472,400	446,100	458,800	472,400	447,400	460,200	473,800
1976	458,300	473,400	489,500	458,400	473,500	489,600	460,200	475,300	491,500
1977	470,700	488,200	506,800	471,000	488,500	507,100	473,300	490,800	509,600
1978	483,300	503,200	524,400	483,900	503,800	525,000	486,700	506,700	528,000
1979	496,100	518,400	542,200	497,000	519,400	543,200	500,300	522,900	546,900
1980	509,000	533,800	560,200	510,500	535,400	561,900	514,300	539,400	566,100
1981	522,000	549,400	578,500	524,100	551,600	580,900	528,500	556,300	585,700
1982	535,100	565,100	596,900	538,000	568,200	600,200	543,000	573,400	605,700
1983	548,400	580,900	615,400	552,200	585,000	619,700	557,700	590,900	626,000
1984	561,600	596,800	634,000	566,400	601,900	639,500	572,600	608,500	646,400
1985	574,800	612,600	652,600	580,800	619,000	659,500	587,600	626,200	667,100
1986	588,000	628,500	671,200	595,200	636,200	679,600	602,600	644,100	687,900
1987	601,100	644,300	689,900	609,700	653,500	699,700	617,700	662,100	708,900
1988	614,300	660,200	708,600	624,100	670,800	720,000	632,800	680,100	729,900
1989	627,400	676,100	727,400	538,600	688,100	740,300	647,900	698,100	750,900
1990	640,500	691,900	746,100	653,000	705,400	760,600	663,000	716,100	772,000
1991	653,600	707,800	764,900	667,500	722,700	781,000	678,100	734,200	793,200

a Fertility rates assumed to decline 1% per annum from 1969 to 1985, held constant thereafter.
b. Fertility rates assumed to decline 1% per annum from 1969 to 1974, held constant thereafter.
c Fertility rates assumed to remain constant at 1969 levels throughout the forecast.
d Level of net annual migration to Calgary assumed throughout the forecast. Mortality rates were assumed to remain constant at 1966 levels in all projections.

Note: 1) The boundaries of the City and Metropolitan Calgary have been the same since August 15, 1964.
2) These forecasts were based on the cohort-survival method of population forecasting.
3) The shaded column represents the projection recommended by The City of Calgary Planning Department.

Source: **Metropolitan Calgary Population Projections 1970 - 1991** (Calgary: City of Calgary Planning Department, May 1970).

city of calgar
planning departmen
december 197

TABLE 3

PROJECTED POPULATION OF METROPOLITAN CALGARY
PERCENTAGE ANNUAL GROWTH RATES
JUNE 1, 1970-1991

Year	Low Fertility[a]			Medium Fertility[b]			High Fertility[c]		
	6000[d]	8000[d]	10,000[d]	6000[d]	8000[d]	10,000[d]	6000[d]	8000[d]	10,000[d]
1970	3.02	3.54	4.10	3.02	3.54	4.10	3.02	3.54	4.10
1971	2.97	3.48	4.01	2.97	3.48	4.01	2.99	3.50	4.03
1972	2.92	3.41	3.92	2.92	3.41	3.92	2.96	3.45	3.96
1973	2.87	3.35	3.84	2.87	3.35	3.84	2.93	3.41	3.90
1974	2.82	3.28	3.75	2.82	3.28	3.75	2.90	3.36	3.84
1975	2.78	3.23	3.68	2.78	3.23	3.68	2.88	3.33	3.78
1976	2.75	3.18	3.61	2.77	3.20	3.63	2.86	3.30	3.73
1977	2.70	3.12	3.54	2.75	3.16	3.58	2.84	3.26	3.67
1978	2.67	3.07	3.47	2.73	3.13	3.53	2.83	3.23	3.62
1979	2.64	3.02	3.40	2.72	3.10	3.48	2.81	3.20	3.57
1980	2.60	2.97	3.33	2.70	3.07	3.43	2.79	3.16	3.52
1981	2.56	2.92	3.26	2.68	3.04	3.38	2.77	3.13	3.47
1982	2.52	2.86	3.18	2.65	3.00	3.32	2.74	3.08	3.41
1983	2.47	2.80	3.11	2.62	2.95	3.26	2.71	3.04	3.34
1984	2.41	2.73	3.02	2.58	2.90	3.19	2.66	2.98	3.27
1985	2.35	2.66	2.94	2.54	2.84	3.12	2.62	2.92	3.20
1986	2.29	2.58	2.85	2.49	2.78	3.05	2.56	2.85	3.12
1987	2.24	2.52	2.78	2.43	2.71	2.97	2.50	2.79	3.04
1988	2.19	2.47	2.71	2.37	2.65	2.89	2.45	2.72	2.96
1989	2.14	2.40	2.65	2.32	2.58	2.82	2.39	2.65	2.89
1990	2.09	2.35	2.58	2.26	2.52	2.75	2.33	2.59	2.81
1991	2.04	2.29	2.51	2.21	2.46	2.68	2.28	2.52	2.74
Average Annual Growth Rate 1970-1991:	2.5	2.8	3.2	2.6	3.0	3.4	2.7	3.1	3.4

a Fertility rates assumed to decline 1% per annum from 1969 to 1985, held constant thereafter.
b Fertility rates assumed to decline 1% per annum from 1969 to 1974, held constant thereafter.
c Fertility rates assumed to remain constant at 1969 levels throughout the forecast.
d Level of net annual migration to Calgary assumed throughout the forecast. Mortality rates were assumed to remain constant at 1966 levels in all projections.

Note: 1) The boundaries of the City and Metropolitan Calgary have been the same since August 15, 1964.
2) These forecasts were based on the cohort-survival method of population forecasting.
3) The shaded column represents the projection recommended by The City of Calgary Planning Department.

Source: **Metropolitan Calgary Population Projections 1970 - 1991** (Calgary: City of Calgary Planning Department, May 1970).

2. The Economy

The City of Calgary Calgary Transportation Study of 1968 disaggregated local employment patterns according to 1964 data and projected them to 1986. This is one of two sources of employment analysis available at the current time, although more recent data and projections should be forthcoming from the Management Systems Department in conjunction with the Urban Evaluation System sometime this year.

In 1964, 105,880 persons out of the Calgary population of 300,300 were employed in some capacity - a labour force participation rate of 35 percent. Of this labour force, 10,843 were employed in manufacturing. In CALTS Study it was estimated that by 1986 some 13.7 percent of a labour force of 288,651 would be employed in manufacturing - 39,545 people.

Similarly, in 1964 business services employed 11,153 persons, about 10.5 percent of the labour force. By 1986, the CALTS Study suggested that employment in business services would increase to 15.5 percent of the labour force, some 44,741 people.

In 1964, according to the same study, 33,051 persons were employed in a category of employment referred to as "unique" - which included those sectors of peculiar importance to Calgary such as petroleum, management and finance. In 1964 this "unique" category of employment was responsible for 19.2 percent of Calgary employment, projected to decline to 10.7 percent by 1986, at which point 30,886 people would be involved.

In the CALTS Study, the sectors of manufacturing, business services and "unique" employment accounted for about 40 percent of employment and this was projected to remain the same until 1986, but with employment rising in manufacturing and business services and falling off by the same percentage amount in "unique" employment. Similarly, the other disaggregated sectors of employment - retail trade, personal services and "other" - were projected to remain at 23.5, 5.4 and 31.2 percent of

total employment respectively. In 1964, 24,842 persons were employed in retail trade, projected to increase to 15,587 by 1986. Similarly, in 1964, 33,051 persons were employed in "other" pursuits, projected to increase to 90,059 by 1986.

The CALTS Study is interesting from a 1973 perspective because it was based on population projections far above those currently accepted by the City of Calgary Planning Department. The 1986 employment level of 288,651 would represent a 45 percent participation rate of the 636,200 population prediction by the City of Calgary Planning Department in 1970 - according to medium fertility and medium migration assumptions. While the labour force participation rate in Calgary and all of Canada is increasing, it is doubtful that it will reach 45 percent in 1986 - depending primarily upon how fast women continue to enter the labour force.

A more recent study by the City of Calgary Planning Department reflects more recent population data and also disaggregates total employment somewhat more precisely than did the CALTS Study.

The Calgary Planning Department several years ago conducted a study which we can use to project labour force by industrial sector to the year 1986. The Planning Department used old population projections which did not anticipate the decline in birth rates and thus estimated a 1986 population of 775,000 for Calgary. For our purposes we will use the more recent Planning Department population estimates with the low fertility and medium migration assumptions. This results in a population of 628,500 by 1986. We accept the older study's estimate with regard to labour force participation rates, about 40 percent. On this basis the labour force by industrial sector in 1986 will be as follows:

Services (including business, personal and public administration)
40.9 percent of the labour force or 102,823

Retail Trade
12.8 percent of the labour force or 32,179

Manufacturing
11.4 percent of the labour force or 28,660

Transportation, communications, utilities and storage
10.8 percent of the labour force or 27,151

Construction
9.7 percent of the labour force or 24,386

Wholesale Trade
8.8 percent of the labour force or 22,123

Mines, Quarries and Oil Wells
5.3 percent of the labour force or 13,324

Agriculture, Forestry and Fisheries
.3 percent of the labour force or 754

(Ref: City of Calgary Planning Department, Forecasts of Total Labor Force for Calgary - 1966 to 1986, 1967)

Calgary continues to grow at a rapid rate. The crucial question about the future is not whether the growth will continue, but how fast. All the available economic indicators of growth show continued vitality. For example, the employment index for Calgary as reported in April, 1973 by the Alberta Bureau of Statistics for various industrial sectors, with 1961 representing a base year and index number of 100 were: mining, including milling, 179.5; manufacturing, 132; construction, 160; transportation, communications and other utilities, 142.6; trade, 140; finance, insurance and real estate, 197.5; services, 247.4; and industrial composite, 160.7.

Similarly, the total number of wage earners continues to increase as do their average hourly and weekly earnings. Bank debits in Calgary increased by more than 12 percent during 1972 when compared to 1971, and so on through the various lead, lag and concurrent indicators of economic activity.

3. Land Use Patterns and Residential Population Distribution in Calgary

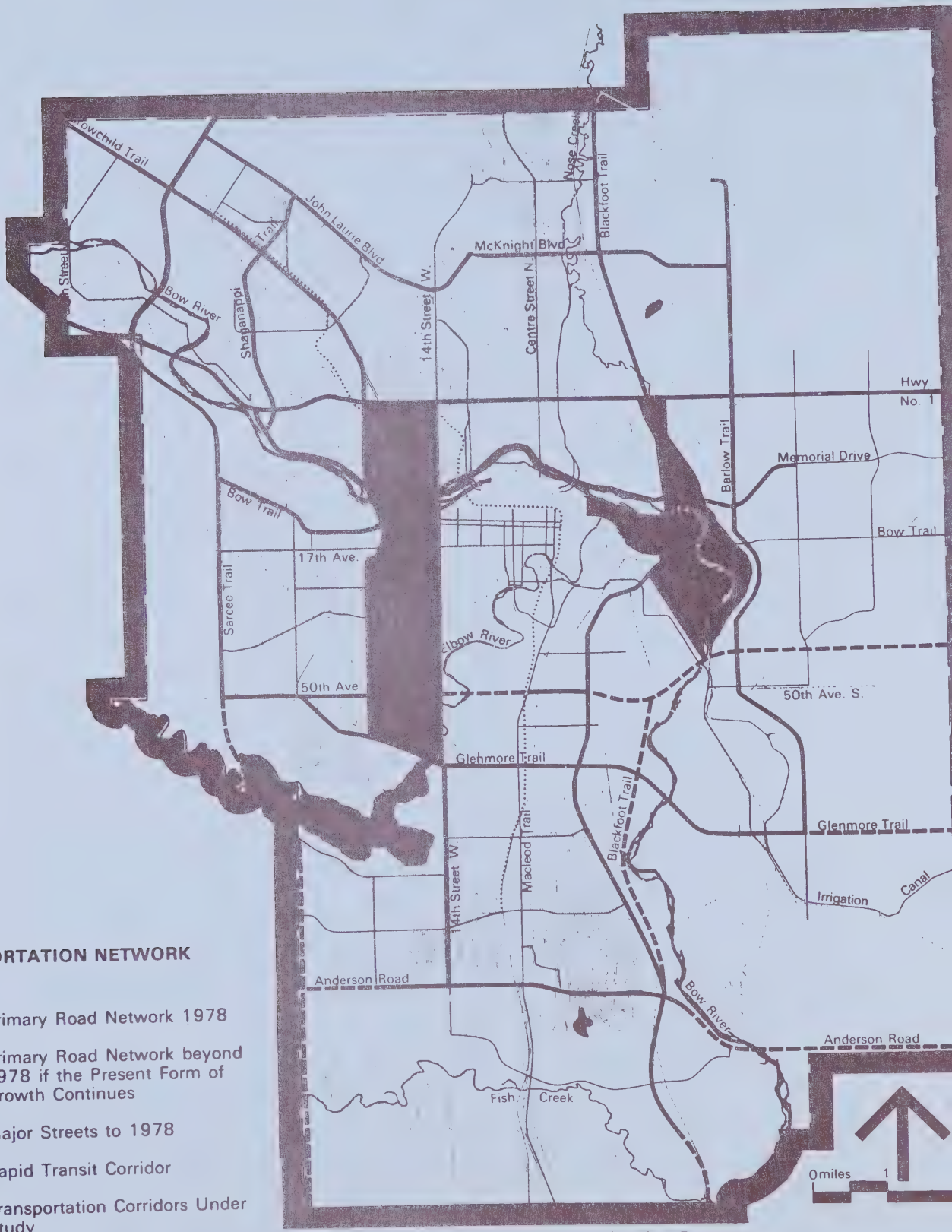
Existing land use patterns in Calgary are shown in Exhibit 6 under "Location and Need". As the Exhibit indicates, residential population has developed most rapidly north and south, with only recent movement to the east. Expansion to the west, both with regard to annexation and population growth, is restricted by Indian Reservations.

While commercial facilities have a large concentration in the inner city, they are more widely distributed than are industrial lands which were largely concentrated in southeast Calgary in 1970.

Residential expansion is expected to continue to concentrate in the north and south, but with continued expansion east of the industrial lands in southeast Calgary. Commercial facilities are expected to concentrate at four regional shopping centres, all of which would be some distance from the proposed Ring Road Corridor unless the Sarcee Trail is extended northwest through the community of Bowness. Industrial growth will continue to concentrate in the southwest, although an expanding industrial potential will be made in the north east area near the airport.

As discussed previously in this report, some of the major population concentrations occur in transportation districts which will be relatively close to the Outer Ring Road Corridor. Residential population growth is essentially toward the northwest, northeast, and wouth with somewhat smaller sector growth slated for the east.

Figure 1

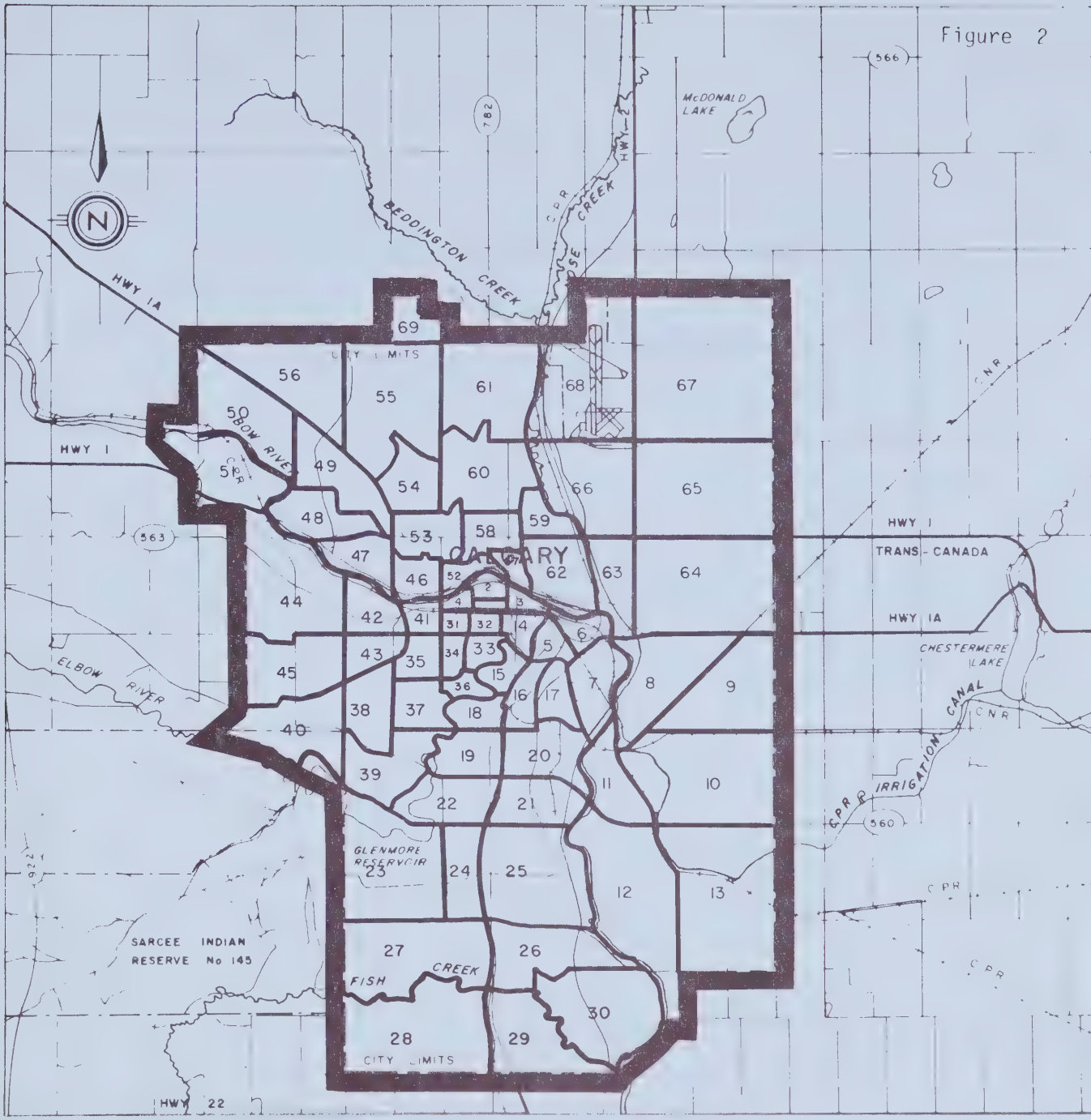


TRANSPORTATION NETWORK 1978

- Primary Road Network 1978
- Primary Road Network beyond 1978 if the Present Form of Growth Continues
- Major Streets to 1978
- Rapid Transit Corridor
- Transportation Corridors Under Study

The Calgary Plan — City of Calgary, Planning Department

Figure 2



Districts		Existing Population (1972)	Holding Capacity
8	DOVER	13,371	*24,834*
11	OGDEN	5,034	*15,300*
23	GLENMORE	7,264	*44,568*
26	BONAVISTAS	3,044	— *25,517*
30	BURNSMEAD		— *18,890*
49	VARSITY	10,394	*30,390*
50	SILVER SPRINGS		*17,900*
56	DALHOUSIE	4,245	*16,843*
64	MARLBOROUGH	17,965	*64,673*
65	AIRPORT SECTOR	103	*55,900*

Existing city population and their projected holding capacity are shown in Figure 2. Clearly the greatest population densities are slated for the Marlborough and Airport sectors in the east which will be very close to the propsed eastern segment of the Ring Road. In the northwest, Silver Springs and Dalhouse and in the southeast the Bonavistas, call for less densely populated areas, while the Dover, Ogden, Glenmore, Varsity and Burnsmead sectors call for greater density.

The unmistable picture which emerges from economic and population growth in Calgary is similar to that of Edmonton and many other Canadian and North American cities. Economic growth, in conjunction with family preferences to move to newer residential areas from established neighborhoods, is creating a familiar pattern of urban sprawl. This sprawl creates new suburbs farther and farther away from the inner city and closer and closer to the proposed Ring Road Corridor.

4. Commercial, Industrial and Recreational Land Use Plans in Calgary

Figure 3 shows what the City of Calgary Planning Department referred to as the existing distribution of commercial facilities in 1969. Most important to the concept of Ring Road Corridors are the potential activity and location of regional shopping centres. The two regional shopping centres in the northwest referred to as prospective in the figure prepared in 1969 are already in operation on a large scale. The prospective regional shopping centre in south Calgary along McLeod Trail has just begun construction activity. North Calgary will have a new regional shopping centre in Huntington Hills, just announced, and undoubtedly there will be a regional shopping centre in the Marlborough region within a few years. This latter centre may well be closer geographically to the Ring Road Corridor than other regional shopping centres.

In Calgary there will certainly occur the same pressures for regional shopping centres at selected intersections of the proposed Ring Road with penetrator roads. However, in the northwest, north and east the potential impact of expressway or freeway access to existing shopping centres from the Ring Road Corridor may minimize this tendency to build regional shopping centres along the Corridor, at least in the short run, until population expansion leapfrogs the Ring Road.

The Land Use Plan (Exhibit 8) gives a detailed analysis of industrial development for the City of Calgary. It demonstrates that the land use for industrial areas to 1978, concentrated on filling in the areas designated for industrial use in the southeast part of the city rather than allocating large segments of land in other areas of the city to industrial use. The principal exception to this southeasterly concentration of industrial land use will be an area between the airport and Highway 1, and another area south of Highway 1, east of Barlow Trail.

Figure 3

DISTRICT OF EXISTING COMMERCIAL FACILITIES
Downtown Core
Regional Shopping Centre
Prospective Regional Shopping Centre Site
Sector Shopping Centre
Neighbourhood Shopping Centre and Other Commercial Facilities
85th Street W.
Crowchild Trail
John Laurie Blvd.
Bow River
Bow Trail
69th Street W.
Sarcee Trail
17th Ave. S.
14th Street W.
Elbow Drive
Centre Street N
Nose Creek
McKnight Blvd.
36th Street E.
Trans Canada Highway
Memorial Drive
Blackfoot Trail
50th Ave. S.
52nd Street E.
Glenmore Trail
Irrigation Canal
Barlow Trail
Anderson Road
37th Street W.
Fish Creek
146 Ave. S.
Edgeboro Trail
Bow River
0 miles 1 2

Park lands in middle and south Calgary will concentrate on facilities contiguous to streams, particularly the Bow and Elbow Rivers. Park lands in the north will also be oriented to the Bow River and to Nose Hill as a natural park as well. A significant part of the recreational park lands would be within fairly easy access of the proposed Ring Road Corridor.

5. Some Preliminary Conclusion About Land Use Planning and the Ring Road Corridor in Calgary.

Indications are that residential expansion will be pushing toward the Ring Road Corridor within the next decade. Westward population movement has already pushed close to the Sarcee Trail, the proposed western segment of the Ring Road. The rapid expansion of Marlborough and other sector plans in the east is expected to place 100,000 population in the near vicinity of a portion of the east Ring Road by 1979. The remainder of the east leg, the north and south Ring Road segments, will be farther away from existing and projected population concentrations. Consequently, these segments would not be utilized to any extent until new areas of population are developed beyond the presently planned development.

Commerical facilities, with particular reference to regional shopping centres, may be within easy acess of the northwest segment of the Ring Road, depending upon its precise final location in relation to Bowness and upgrading of Highway #1A. A regional shopping centre in Marlborough would serve a large population and be within easy access of the east segment of the Corridor. Ring Road-Penetrator Road regional shopping centres might be expected to develop originally toward the southeast segment of the Ring Road, and possibly southwest.

Costs

The proposed Calgary Ring Road is to be approximately 58.2 miles in length. Of this distance 5.5 miles (the Sarcee Trail) is presently a 4-lane divided highway, and there is 6.5 miles of existing undivided roadway. There is no present roadway for the remaining 36.4 miles. Thus about 52.7 miles of land acquisition and major highway construction would be required to complete the Ring Road.

In developing cost estimates for this proposed Ring Road, four factors ought to be considered: land costs, construction costs, certain "additional" costs, and external costs.

1. Land and Construction Costs

Calgary's plans for industrial parks are not closely related to the prospect of a Ring Road at the present time. The industrial area in the southeast is, however, close to Blackfoot Trail, should that facility become part of an Inner or Outer Ring Road. If business firms find the Ring Road an important determinant of industrial location, trucking and other facilities would be consistent with industrial land use of the southeast section of the City, and therefore, the southeast segment of the Ring Road.

Park land use in Calgary will probably find a reasonable amount of this kind of land allocation within easy access of the Ring Road Corridor. Moreover, since the City is already such a large size in square miles, there will be reserved lands on the periphery but within limits of the City for some time which could be used for additional park land. These areas, of course, are in addition to the many other areas outside the city limits - particularly north, west and south - which could easily be developed into additional regional parks; again with easy access to the Ring Road Corridor.

However, for purposes of this general socio-economic impact

analysis, we believe that this technique produces adequate approximations of likely costs.

On the basis of 1973 costs, it is estimated that a 4-lane divided highway would cost approximately $3.3 million per mile - including land purchase, interchanges, a 350 ft. right-of-way, bridges, overpasses, and frontage roads.

Whether or not the actual dollar figure estimated here is one or two million dollars off, in one direction of another, is of little consequence to this analysis. For the basic question is: Can or should Alberta invest in the order of two hundred millions of dollars in this kind of urban highway development .

Clearly, there is no simple answer to that question. For there may well be certain "additional" and external costs that must be added to this estimate. And, there are certain anticipated benefits that must be considered and "weighted in the balance".

Let us first proceed to the other costs.

2. Additional Costs of a Ring Road Corridor

To this point we have considered only two costs of the Ring Road System: land and construction. As noted, however, it is unlikely that any Ring Road System can be justified on grounds of highway considerations alone. Indeed, the land costs suggested contemplate a wider set of activities than automobile traffic. Thus, it does not seem legitimate to discuss a wider set of objectives of a Corridor and a wider set of benefits which will flow from a Corridor without at least initiating some discussion of the wider set of costs these activities will generate.

It is not possible with existing data to suggest even a range within which these additional costs will fall. All that can be done at this point is to mention the cost-increasing activities which serve as part of the justification for the Ring Road Corridor. Cycle and equestrian paths, for example, are likely to be interesting and well-received additions to a Ring Road Corridor - but not without cost. If regional parks are developed either contiguous to or in some geographic relationship to the Ring Road Corridor, they will represent an activity which creates broad public support - but not without cost. On the other hand, if regional parks in relation to the Ring Road just substitute for parks in other places, there is no reason to assume significant cost increases. If the Ring Road Corridor requires a significant amount of expansion, landscaping and/or engineering innovations to make it more consistent, for example, with community noise standards, then this is an incremental cost which should be brought into the cost analysis.

3. External Costs of a Ring Road

By external costs we refer to those incremental costs which are not part of the direct transaction costs: the environmental costs which a poorly designed Corridor would impose on the communities in the form of noise pollution, air pollution, water deterioration, etc., for example. If society accepts these lower standards, the cost takes the form of decreases in quality of life. If society imposes standards and takes action to eliminate the environmental costs, then the costs will most often take the form of incremental spending by public agencies. In either case, cost increments occur - either social or monetary.

This is not to suggest that only external dis-economies may attach to the Ring Road Corridor. It is entirely possible that external economies or benefits may be generated. For example, if the Ring Road were to have a significant impact on vehicle movement into the inner city, dispersing truck traffic to peripheral eco-systems, then an external benefit of the Ring Road would occur. The possibility of external benefits is mentioned here only in the interest of pointing out that they may occur as a partial offset to external costs, which should be clearly treated as a facet of the total cost of the proposed project.

The other significant externality is the probable impact of the project on the budgets of the City. It is entirely possible that the construction of a Ring Road Corridor will impose incremental costs on City budgets: in relation to interchanges between arterial roads and the Ring Roads; in relation to improving arterial roads and penetrator systems, etc. The reason that this should be treated as an external cost in relation to city budgets is that it may not correspond with priorities which the City has developed for itself. If this occurs, and city values and priorities must take a different order and sequence than planned, a serious problem of inter-governmental relationships occurs.

Related to this external impact on the budget of the City is the possible indirect cost related to other forms of city services which may be generated by Ring Road Corridors. For example, if the Ring Roads were

to have the effect of dispersing residential population to suburban areas lying outside the Ring Roads in place of filling in developing areas within the Ring Roads, then it is clearly possible that the costs of local government provision of water, sewer systems, etc., would be increased in at least two ways. First, the costs would increase by extending the utility systems greater lineal distances; and second, the cost would increase as a result of less than maximum uses of utility services already in place in developed and developing areas of the cities inside the Ring Road Corridors. In other words, if the Ring Roads increase the tendency to urban sprawl, there will be corollary increases in unit costs of utility services.

Finally, in the matter of possible external costs, is the potential disclocation of established commercial enterprises and shopping centres. If the Ring Roads have the effect of displacing and redirecting commercial traffic from already existing firms to regional shopping centres peripheral to the Ring Roads, then some of the cost of Ring Road Systems will be borne by business enterprises which lose out to new facilities near the Corridor. Again, there will be external benefits such as added convenience to consumers and some dispersion of commercial trucking. But it should be noted that these benefits may be partially offset by less-than-optimal use of existing facilities and possible deterioration of established shopping centres.

This same phenomenon can occur in residential facilities. As home owners forsake the older areas of a city for the more attractive and often less expensive homes and land in suburbia, serious problems of under-utilization in older sections of a city can occur. One of the troublesome facets of this under-utilization of existing facilities has occurred in Calgary in recent years in the form of a large number of spare classrooms in public schools in older sections of the City. The trend is exacerbated in any tendency by local government to subsidize extended services and utilities.

Benefits and Trade-offs

Our analysis of potential benefits does not follow the conventional approach: monetizing the benefits of public programs and comparing these with costs. The difficulty with that approach is that many kinds of benefits cannot be quantified, let alone monetized; thus attempts to define benefit-cost ratios are dangerous when used for policy analysis. We shall avoid them and discuss the issue rather in terms of trade-offs.

1. The Impact of Ring Roads on Urban Form

Urban form can be influenced in undesirable as well as desirable ways by transportation systems. Hence, we asked: Can it be assured that the proposed road will have the desired effect?

One facet of the question of urban form relates to the net impact of a Ring Road on the rate of economic and population growth. Will the Corridors act as a deterrent to economic and population growth? We find little, if anything, to suggest that the rate of economic and population growth will be depressed by Ring Roads. On the contrary, there is reason to believe that the availability of land in the vicinity of a Ring Road will act as an attraction in industrial location decisions.

Whether or not this impact on industrial development, economic and population growth and, therefore, urban form is desirable depends upon public policy toward economic growth. One element, however, requires specific comment. Ring Roads are likely to make the City more attractive for industrial development, relative to smaller towns and cities in the Province. Thus, if provincial government policy is to direct economic growth away from existing urban centres and toward smaller cities, the potential conflict between this objective and the impact of Ring Roads on economic growth should be noted.

Another facet of the impact of Ring Roads on urban form is the potential effect Ring Roads will have on the location of commercial enterprises and shopping centres; as noted previously, there are both benefits and costs associated with this development.

But, the relationship between residential growth, dispersal and urban form is worthy of note. If the development of a Ring Road causes shifts in residential population from older areas within the City to new suburbs beyond the Ring Road, this urban sprawl is not necessarily a benefit to the cities, even though the newly dispersed population will then have occasion to use the Corridor in many ways and will therefore increase the traffic flow along the Corridor System. It remains a vital question whether or not any significant benefit has accrued to cities by virtue of this urban sprawl, which in turn has generated increased traffic on the Corridor.

Suffice it to say, in this regard, that one of the most important questions from the City perspective is how Ring Road Systems can be used to affect changes in urban form which confer a net benefit on urban populations. For example, if Ring Roads were to concentrate residential development within, along and outside the Corridor instead of having it develop along specific arterials in the form of residential strip development, this could confer some benefits on cities. One of the important considerations in Ring Road development, then, would appear to be a close liaison between provincial and city governments in the interests of maximizing the benefits of changes in urban form attendant to Ring Road Corridors. An obvious illustration of the potential payoff involved in this close coordination relates to city, regional and provincial park facilities.

2. Transportation Planning in Relation to a Reserved Corridor

As one considers the existing form of residential development in Calgary and projects this development into the future, it is clear that in many areas in which Ring Road segments are planned, residential development is imminent. This being the case, it necessarily follows that some form of transportation system will have to be devised to service these developments. Roads and arterial highways will be constructed to connect new suburbs with existing segments of the City.

It is within this context that one of the benefits of Ring Road Corridors can be anticipated. Since there appears to be little doubt that development in the City will eventually reach and extend beyond the Ring Roads, is it not likely that optimal transportation systems will be approached more readily by planning for Ring Roads now in conjunction with other facets of city road and highway facilities? Thus, one potential benefit of Ring Road Systems is that they will permit a higher level of integrated planning than will occur in their absence.

Planning with regard to Ring Road Systems can take many forms. The most obvious is planning the transportation inter-relationships between the Ring Roads and the other elements of city transportation systems - e.g., roads, freeways, rapid transit, and bus systems. Less obvious is the planning relationships between the Ring Road System and the other elements of public programs which will relate to it. For example, utility system planning can be influenced by the Corridor concept around which the Ring Road discussion revolves. Park and recreation planning should be closely related to Ring Road Systems and the benefits which flow from park and recreation facilities can be importantly influenced by the manner in which they are made more accessible by Ring Roads.

Part of the rationale of reserving a Corridor from which plans for transportation, utility, and recreation systems can derive is to

prosper from the experience of other cities. Some cities have planned wisely with regard to Ring Roads and population growth; some cities have planned badly in this regard; and other cities have not planned at all. However, cities with the growth potential of Calgary need to explore carefully the implications of non-planning in this regard and to contemplate the record of other city experience. This, incidentally, does not imply that Ring Roads have always proved to be the source of massive benefits - witness the case of Winnipeg and its Ring Road, which is too far away from the city to provide a vital ingredient of the city's transportation system. The Winnipeg case, however, proves the case for integrated planning more than anything else. It also demonstrates that there are conditions in which Ring Road Systems are not necessarily efficient investments of public funds - depending, perhaps, upon size, growth prospects and precise placement of the Ring Road.

In summary, then, one set of benefits which would flow from Ring Roads derives from improved form, structure and function of roads which will develop in the areas of the proposed Ring Roads in any event.

3. Recreational Facilities and the Ring Roads

Enough has been said in previous sections to indicate that one of the major categories of benefits associated with Ring Road development is recreation.

Ring Roads themselves, properly developed with greenbelt parkways on either side, provide one form of recreation directly to the family which finds pleasure in riding in pleasant surroundings. Attendant to this activity are those that could be conducted in close physical relationship with the Ring Roads such as cycle and equestrian paths.

Another level of recreational potential associated with Ring Roads is the park and picnic facility made available on land contiguous to the Corridor and which represents additional family recreational potential in urban areas.

One step from this is a similar benefit. We refer to the urban, regional or provincial park which is designed and planned in conjunction with the Ring Roads but which may be separated from the corridor by some distance and which offers additional recreational opportunity to the park and picnic facility referred to above.

Yet another recreational benefit related to the corridor is the easier access it affords urban dwellers on their way to mountain parks, provincial parks, other provinces, etc., some distance away from the urban area. This is essentially a bypass function affording the opportunity to leave the city with a minimum of traffic congestion and delay.

4. The Problem of Truck Traffic

While it is useless to deny the contribution that truck traffic makes to the flow of goods and services in modern society, all urban dwellers at one time or another have wondered whether the benefits of truck traffic outweight their external costs in the form of lost time, noise, air and scenic pollution of the environment. The contribution they could make to maintaining the benefits of truck traffic while minimizing the costs is one of the potential benefits Ring Roads provide, if only on a modest scale.

In this regard, we should first of all deflate some of the romantic notions that might be associated with Ring Road development and truck traffic. The most serious problem growing out of truck traffic in urban centres is the fact that so many of them have an inner city destination. Ring Roads will not remove the requirement that goods be transported to commercial centres in the city cores. But they could have at least a minor impact on inner city traffic congestion if certain things occur. First, if a Ring Road redirects some commercial establishments to the periphery of thecity away from the inner city, then some measure of traffic relief may be afforded. This prospect is not without external costs to business firms in established centres whose business declines, but is of benefit to the commercial customer who has greater access to facilities with minimal traffic congestion.

A second element relating to truck traffic has also been referred to briefly. This is the possibility of dispersing truck terminals, warehouses, etc., away from the inner city to land contiguous to the Ring Roads. In this regard, substantial relief from inner city traffic congestion is at least possible. This is essentially a city bypass benefit. In a City such as Calgary, there could be a significant amount of bypass traffic.

5. The General Bypass Benefit

Bypass benefits, of course, are not solely related to truck traffic. Since Calgary is located on the Trans-Canada Highway - which runs east to west - and a major north-south highway in the province, the bypass benefit of the proposed Ring Roads could be very significant in alleviating the traffic problems of the City.

The bypass benefits of the proposed Ring Roads may be modest; but, they are too significant to ignore.

6. The Major Benefit - More Efficient Traffic Flow in and Around the City

While the above list of benefit considerations add an important dimension to the possible justification of Ring Road Corridors, ultimately the proposal must meet the test of making a significant contribution to the flow of vehicular traffic in and around the City. Major traffic problems in most urban centres, Calgary included, relate to the peak load traffic generated by the trip to and from work. We have noted that the Ring Road Corridors - at least in the short term - are not likely to lessen traffic congestion caused by work trips; they will not provide alternate routes to job destinations within the inner city. So many job-bound drivers will have to use those parts of the transportation system that radiate inward to job centres. Thus, if Ring Roads are to have a significant impact on work trips, they will have to be carefully coordinated with other elements of the transportation system in order to provide direct access to penetrator modes of transportation.

Clearly then, one of the most important questions is whether or not the Ring Road could and will reduce traffic congestion related to work trips.

The shopping trip in urban centres is not as troublesome, in a transportation sense, as the work trip because it occurs through the day and night and therefore does not present a peak-load problem. Thus, the impact of Ring Roads in the matter of shopping trips is necessarily of less significance than that of work trips.

However, we may view the impact of Ring Roads on shopping trips as essentially a matter of consumer convenience. But a Ring Road will permit easier access to the same set of penetrator modes of transportation into the inner city as those discussed under work trips. Also, Ring Roads are likely to provide alternatives to shopping trips to urban centres because the Corridors themselves tend to attract a new set of regional shopping centres at points of intersection between penetrator highways and the Ring Roads.

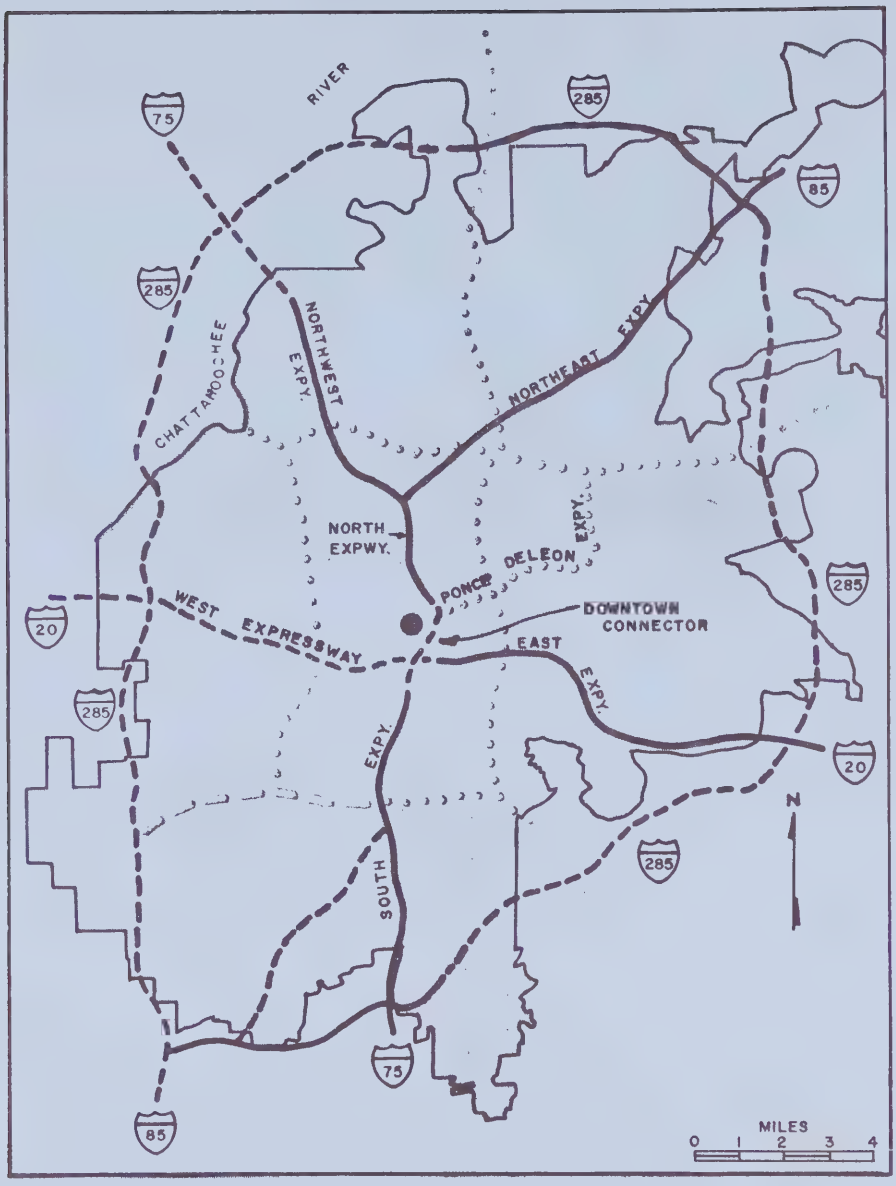
This discussion of Ring Roads in relation to work trips and shopping trips tends to emphasize their potential impact on the traffic flow within the City. Ring Roads, however, can also be viewed in relation to their incorporation to the regional highway system which accommodates rural as well as urban traffic. We have alluded to this previously in relation to recreation trips by urban dwellers whose access to points outside the cities is improved by the existence of Ring Road Corridors. The other dimension of the relationships is how well the Ring Roads mesh with the regional transportation systems of which they are part, and the flow of benefits which may accrue to highway users outside the City. Benefits from Ring Roads will develop as a function of at least two elements in relation to the regional highway system: first, the bypass element; and second, the element of dispersing traffic to various sections of the cities as that traffic funnels into the urban complex.

Some Comparative Situations

One of the troublesome aspects of the development of the Outer Ring Roads is their apparent lack of planned relationship to Inner Ring Roads. While there are penetrator roads connecting the Outer Rings with the Inner Rings, little analysis emphasizes the functional relationship between the two Ring Systems. We have already referred to the experience of Winnipeg, which emphasizes the need for careful planning of Ring Road location. We have likewise referred to Washington, D.C. where the Capitol Beltway has had a massive impact on the orderly flow of traffic between Washington, D.C. and its Maryland and Virginia suburbs and between the suburbs themselves. Toronto has successfully developed Ring Road segments although perhaps in an inadequate way. The American cities of Boston, Jacksonville, Atlanta, Houston and Dallas have experimented successfully with Ring Roads, although what was originally considered Outer Rings have become Inner Rings in some instances. Similarly, some European cities have introduced Ring Roads with gratifying results.

The most significant conclusion we can draw from the experience of other cities is that for the most part Ring Roads have become a vital part of the overall transportation system. However, this success has been partly a function of size. In some of the most interesting applications of Ring Roads the population exceeds that of Calgary. Some idea of the physical and population variables relating to the experiences of American cities is shown in Figures 4 through 11.

Figure 4



Central Business District ●

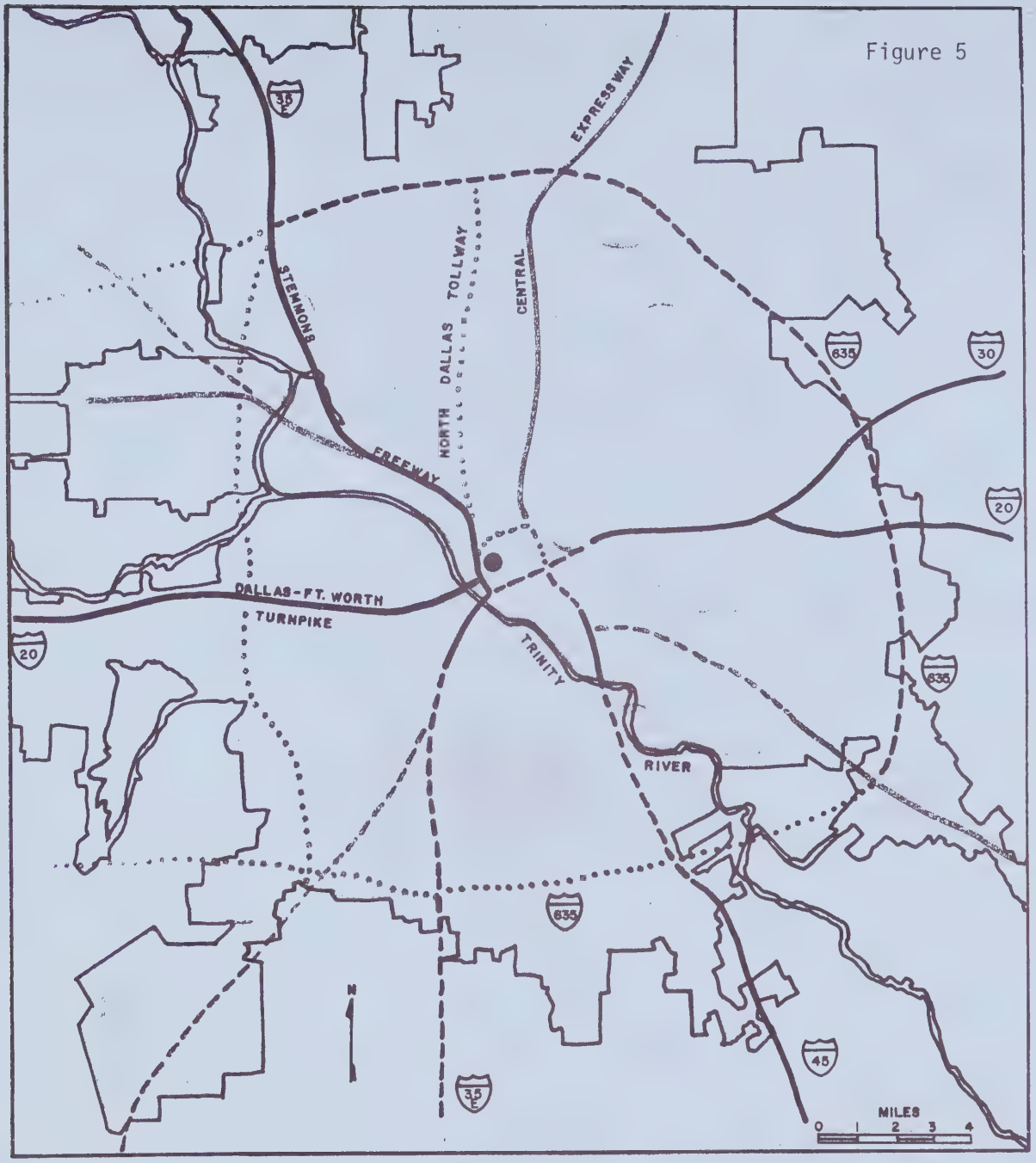
Urbanized Area Limits ▭

ATLANTA

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	128	118	246
Population	487,455	280,670	768,125
Persons per sq. mile	3,802	2,387	3,125
Private Automobile Registration	132,049	101,409	233,458
Persons per Automobile	3.7	2.8	3.3

Figure 5



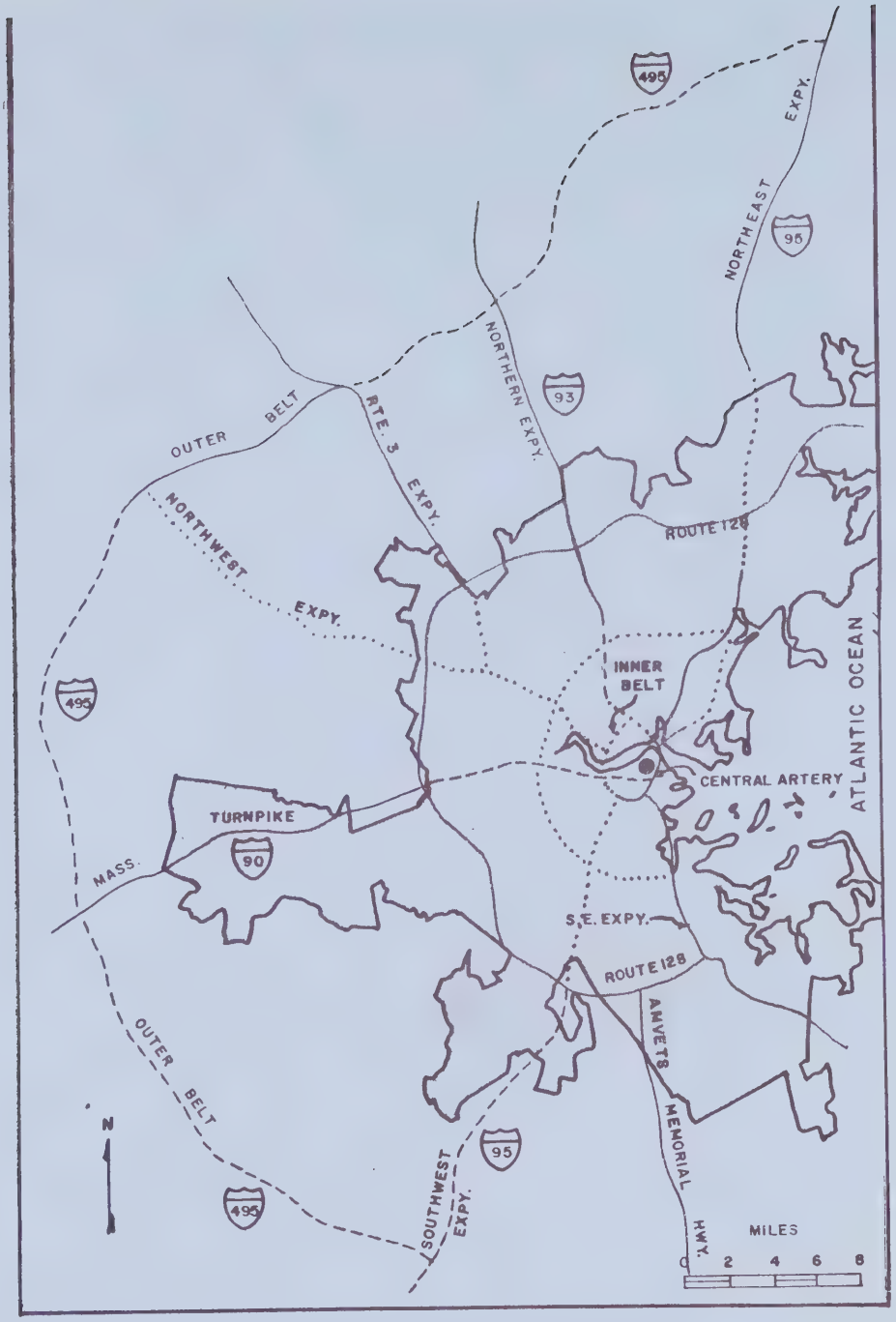
Central Business District ● Urbanized Area Limits ▭

DALLAS

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	280	367	647
Population	679,684	252,665	932,349
Persons per sq. mile	2,428	688	1,441
Private Automobile Registration	244,561	99,391	343,952
Persons per Automobile	2.8	2.5	2.7

Figure 6



Central Business District ●

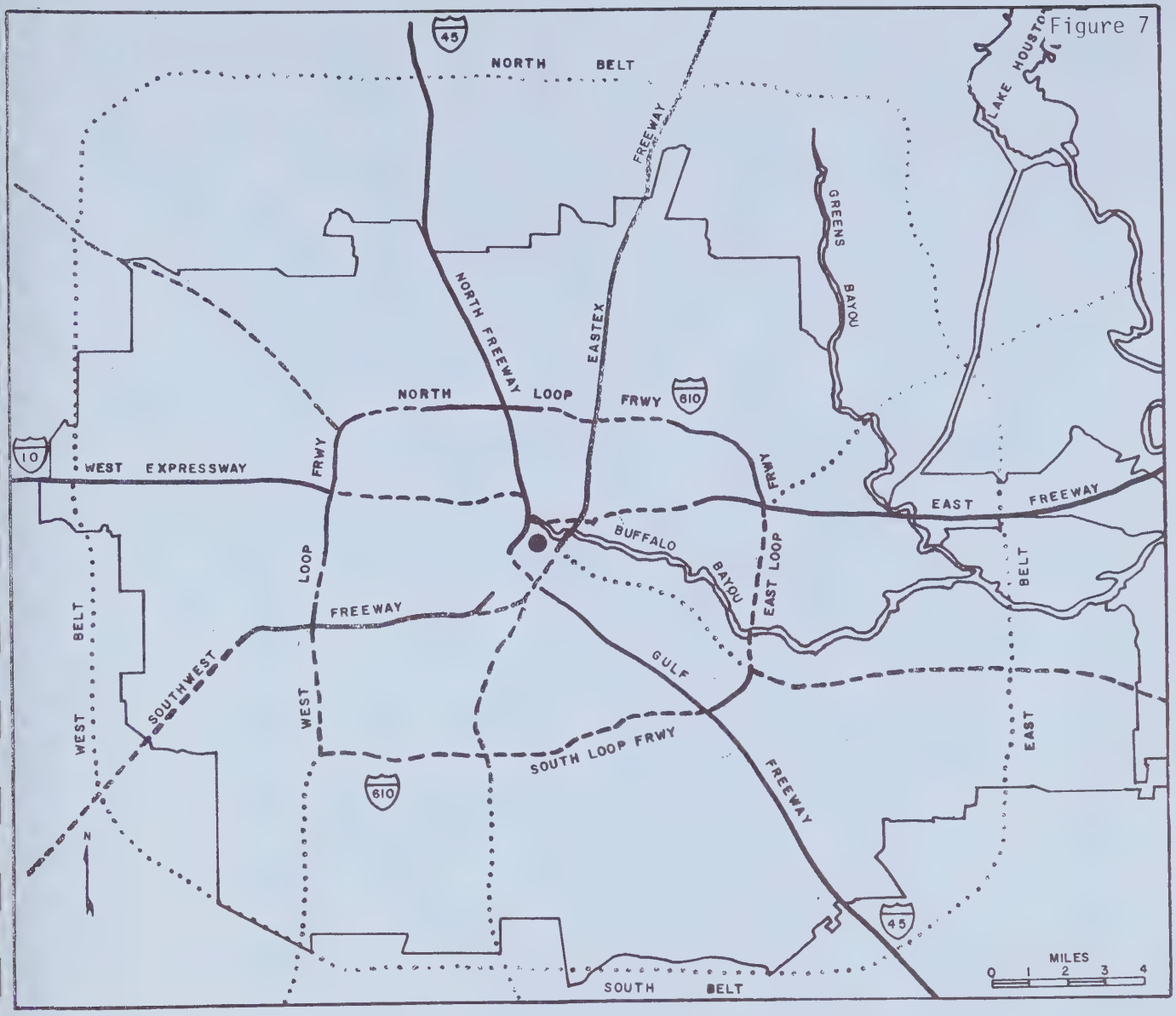
Urbanized Area Limits ▭

BOSTON

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	48	468	516
Population	697,197	1,716,039	2,413,236
Persons per sq. mile	14,586	3,667	4,679
Private Automobile Registration	135,674	507,311	642,985
Persons per Automobile	5.1	3.4	3.8

Figure 7



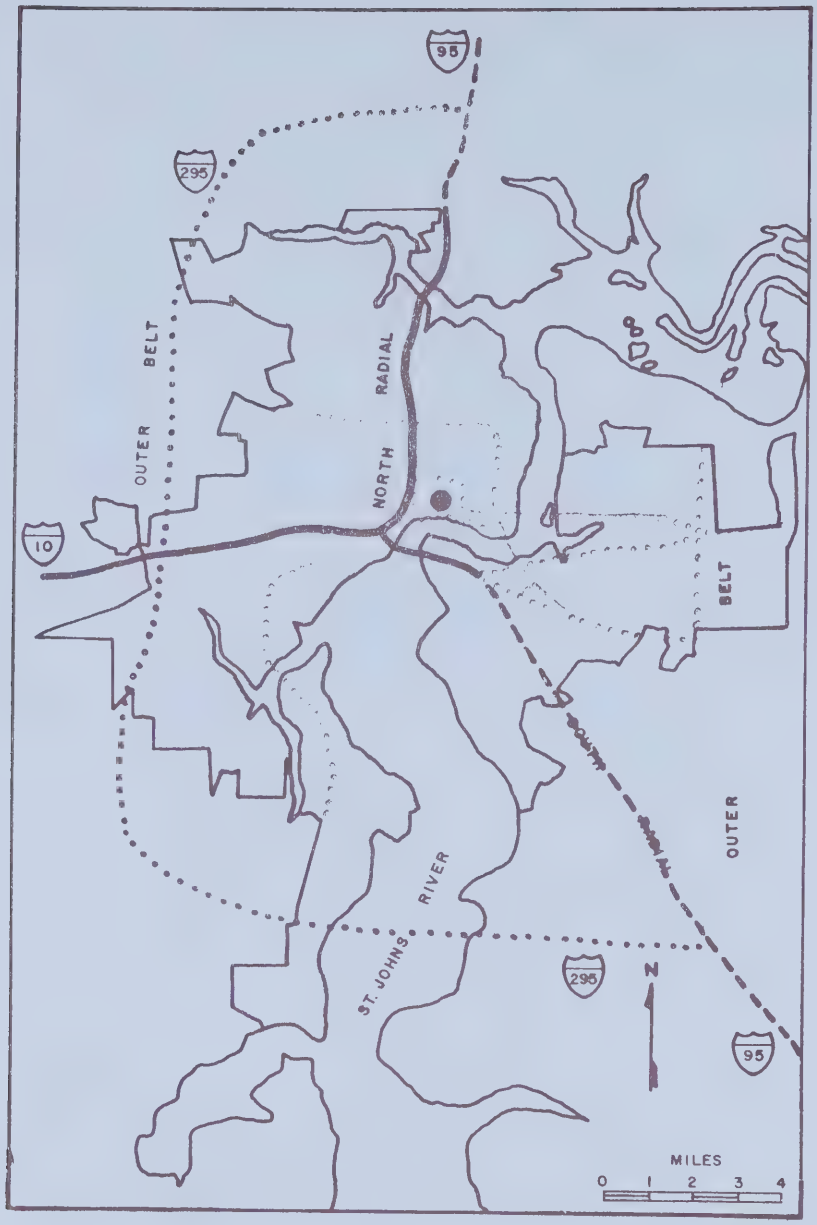
Central Business District ● Urbanized Area Limits ▭

HOUSTON

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	328	102	430
Population	938,219	201,459	1,139,678
Persons per sq. mile	2,860	1,967	2,647
Private Automobile Registration	316,764	73,335	390,099
Persons per Automobile	3.0	2.8	2.9

Figure 8



Central Business District ●

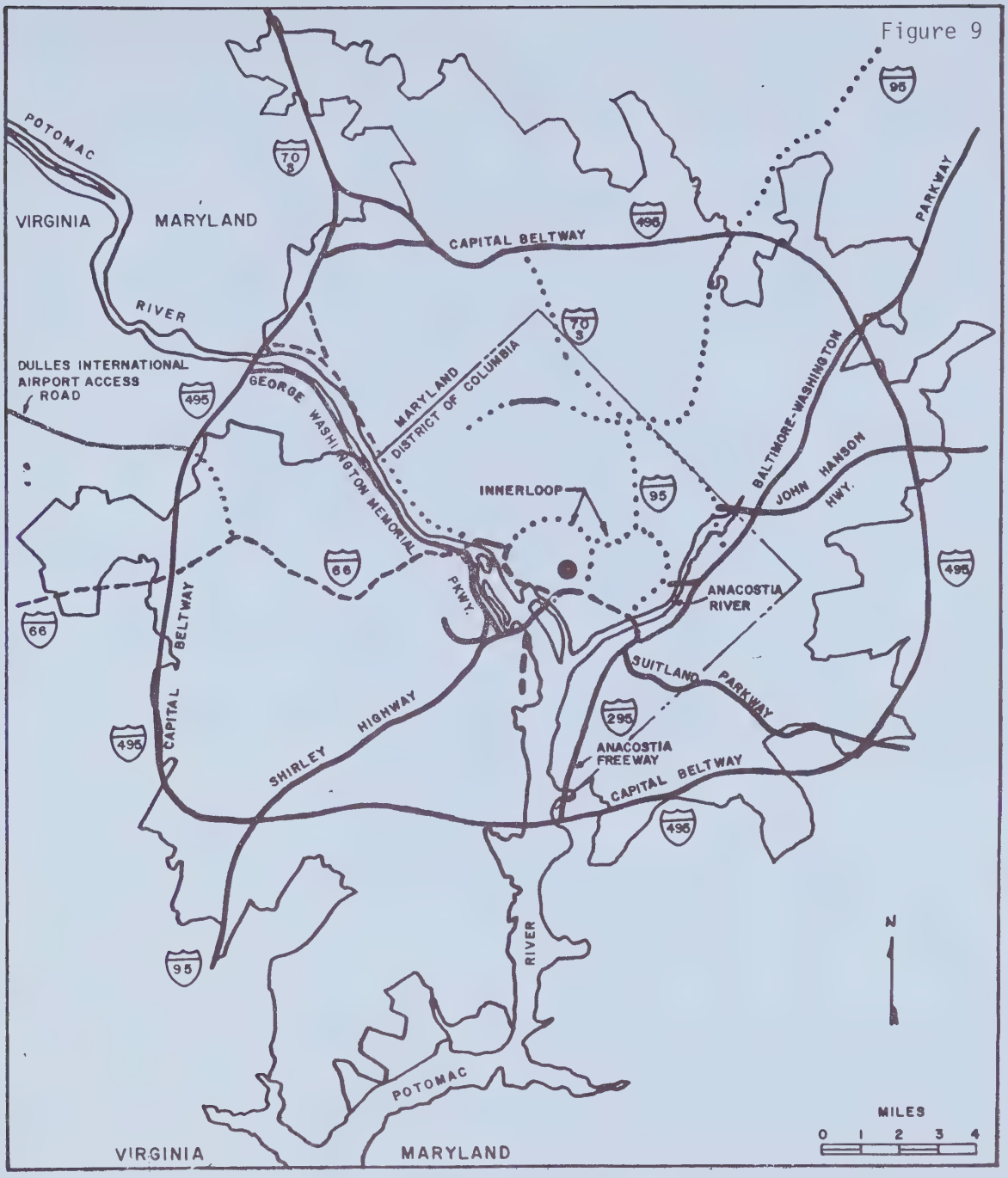
Urbanized Area Limits ▭

JACKSONVILLE

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	30	81	111
Population	201,030	171,539	372,569
Persons per sq. mile	6,657	2,113	3,344
Private Automobile Registration	50,907	60,123	111,030
Persons per Automobile	4.0	2.9	3.4

Figure 9



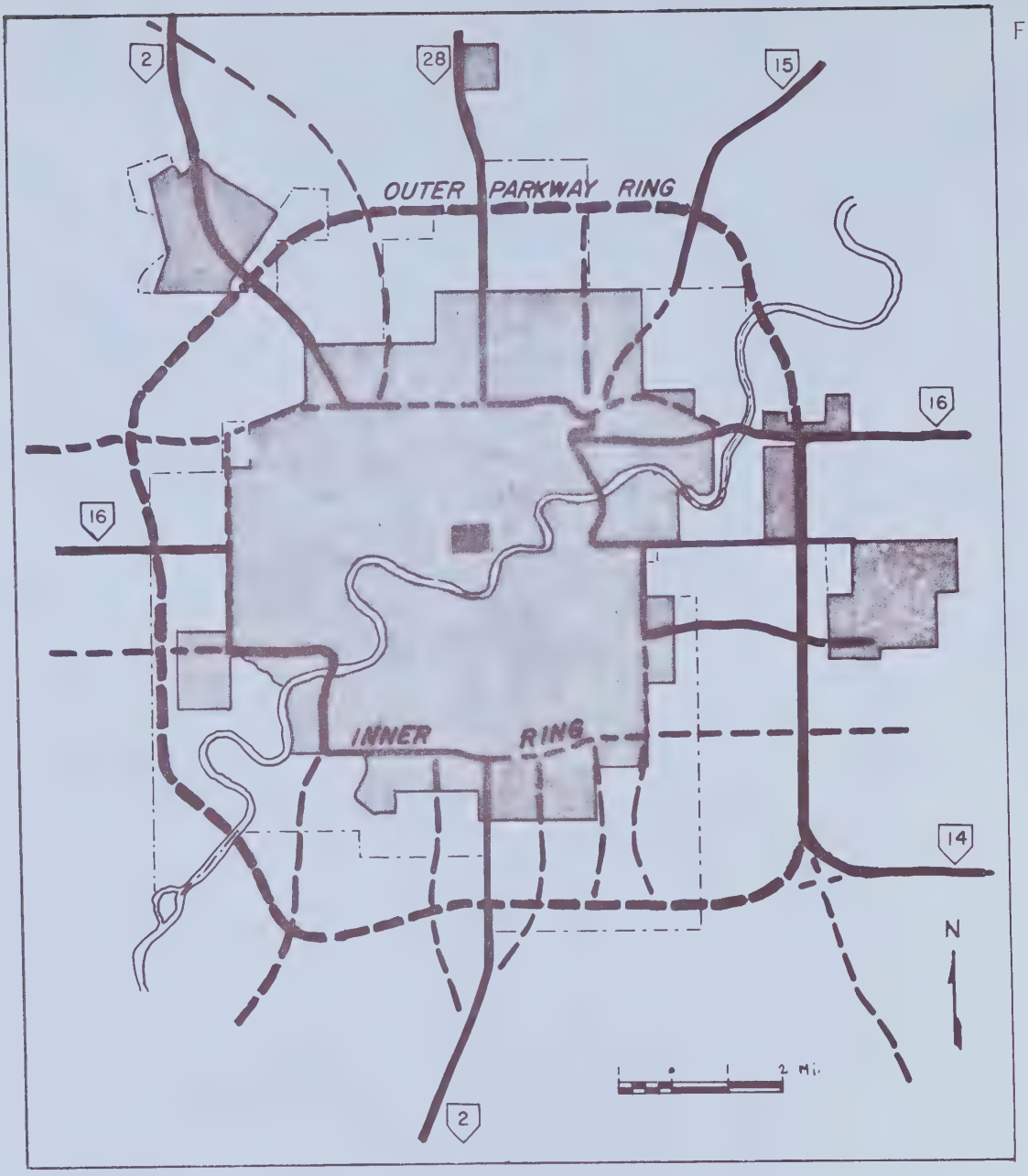
Central Business District ● Urbanized Area Limits ▭

WASHINGTON D.C.

STATISTICS

	Central City	Suburban Area	Total Urbanized Area
Area (sq. miles)	61	279	340
Population	763,956	1,044,467	1,808,423
Persons per sq. mile	12,442	3,740	5,308
Private Automobile Registration	159,589	357,958	517,547
Persons per Automobile	4.8	2.9	3.5

Figure 10



Central Business District ● Urbanized Area Limits

EDMONTON

STATISTICS (Metropolitan Edmonton)

Area (City Limits in sq. miles)	122
Population (1972 estimate)	450,641
Persons per square mile	3,694
Private Auto Registration	171,000
Persons Per Automobile	2.63

Figure 11

CALGARY

STATISTICS (Metropolitan Calgary)

Area (City Limits in sq. miles)	156.0
Population (1972 estimate)	412,777.
Persons per square mile	2,646.
Private Auto Registration	174,029.
Person per Automobile	2.37

Conclusions and Guidelines to Policy

1. If a Ring Road is to meet the needs of an automobile-oriented society, it must be carefully integrated into a transportation system which has as its main objective the improved flow of traffic within urban centres. The most pressing problem is peak hour traffic into the inner city. And it is clear that a Ring Road cannot make a substantial contribution to the relief of peak load work-trip traffic - unless it de-emphasizes the flow of automobile traffic to the downtown business district and acts as a collector of automobile traffic for other forms of penetration of the inner city. Thus, a Ring Road will make a significant contribution to urban traffic flows only to the extent that it feeds people into other forms of transportation to the city centre - the most obvious examples being light rapid transit and high-speed bus systems.

2. But a Ring Road can also lead to other benefits: it can enhance recreational opportunities; it can provide the mechanism for Corridor planning of utility systems; and it can provide for bypass traffic and the minimization of truck concentrations in the interior city.

3. With proper related land use planning, the Ring Road can allow a city to maintain a wide area of flexibility with regard to urban form; patterns of suburban development; patterns of industrial development; and patterns of recreational development.

4. But if a Ring Road is to be justified by the wide set of benefits it may make possible, it is important to note also that such supplemental benefits give rise to additional costs. For example, recreational facilities and accessibility - an important benefit consideration - add to the total costs of the project.

In summary, we conclude that a Ring Road cannot be judged, in and of itself, to be good or bad, desirable or undesirable, worth the

investment or not worth the investment.

To the extent that such a facility is developed in the context of a host of desirable related policies, it could and should prove to be a contributor to the well-being of the City's citizens.

However, to the extent that such a facility is developed as good in its own right - it is as likely to be a disaster as it is a success.

The potential benefits and costs, social, economic and environmental, discussed in this report, must be analysed in light of these two approaches before they will serve to illuminate the critical policy issues at stake.